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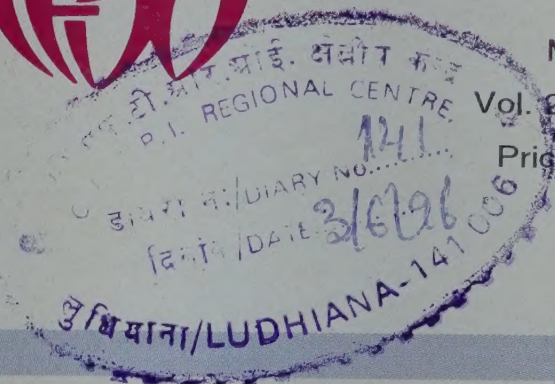
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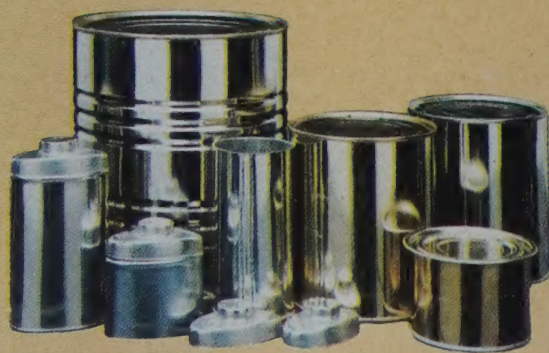
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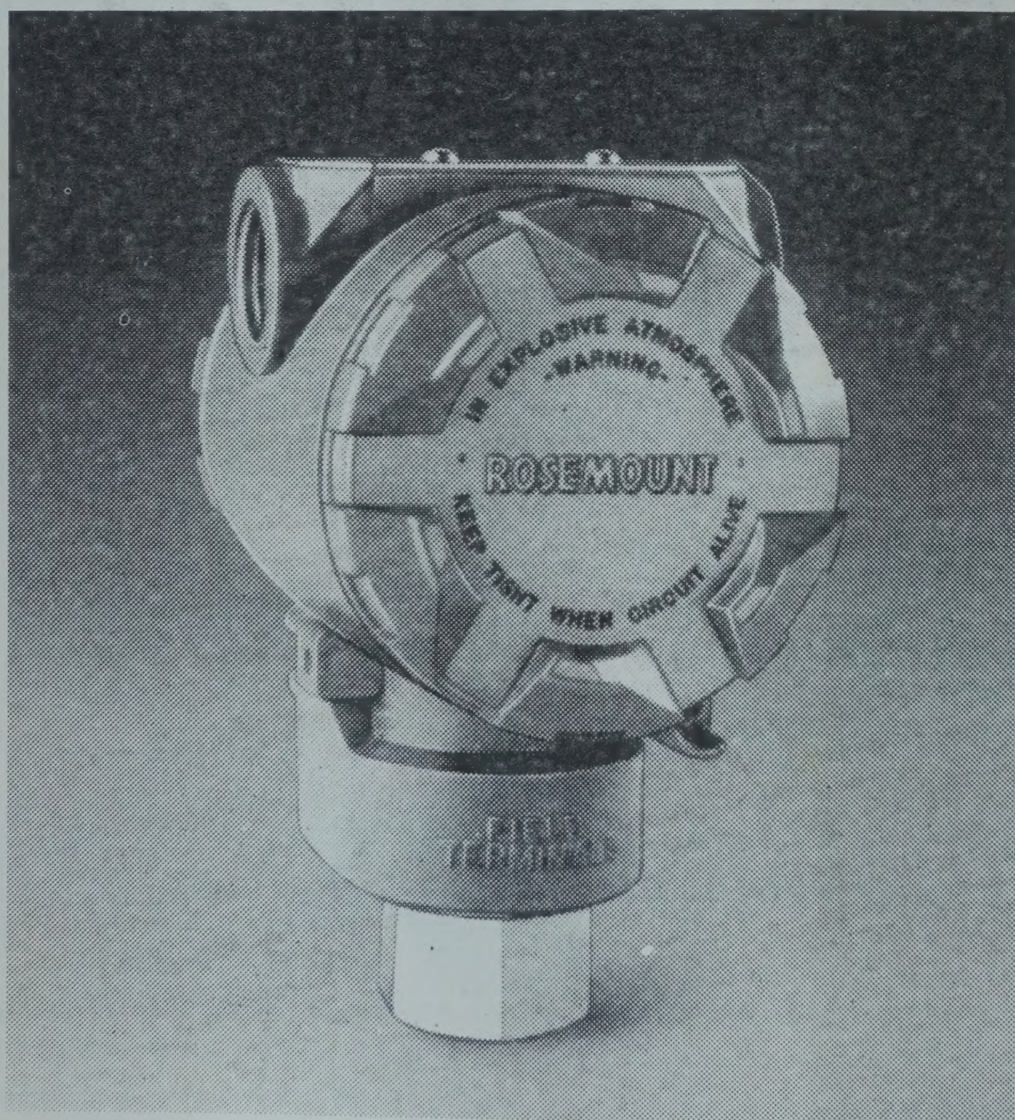
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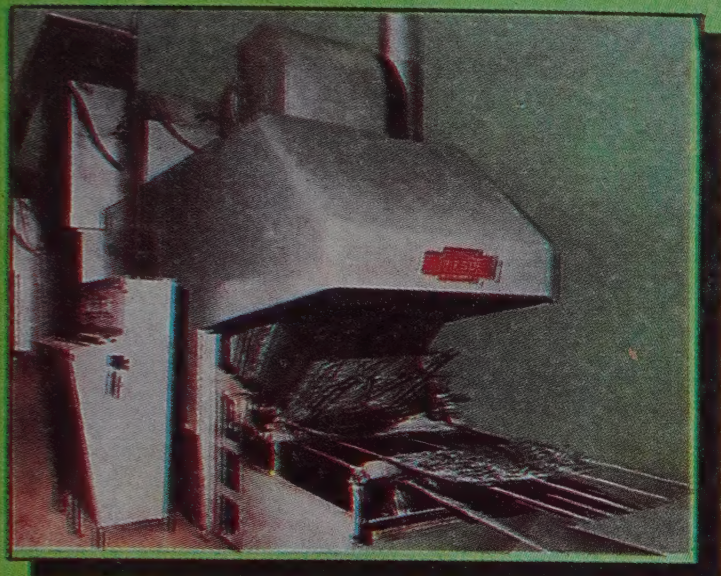
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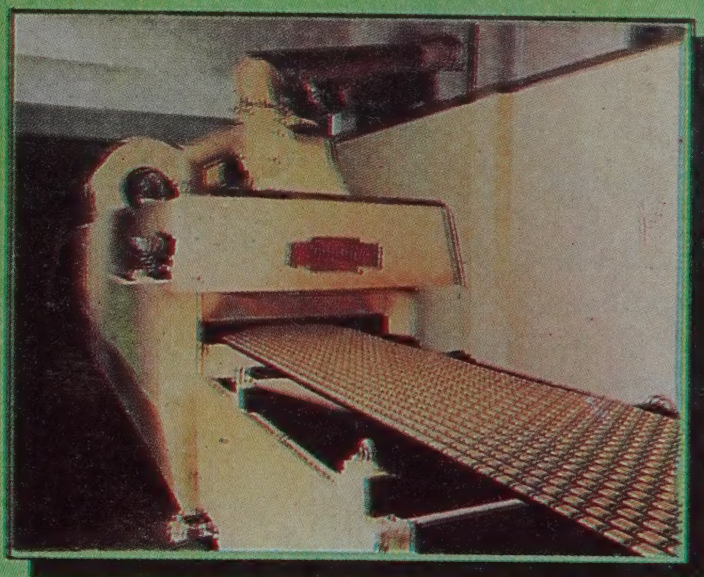
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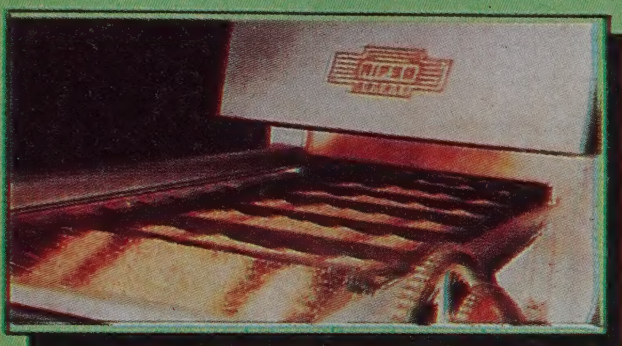


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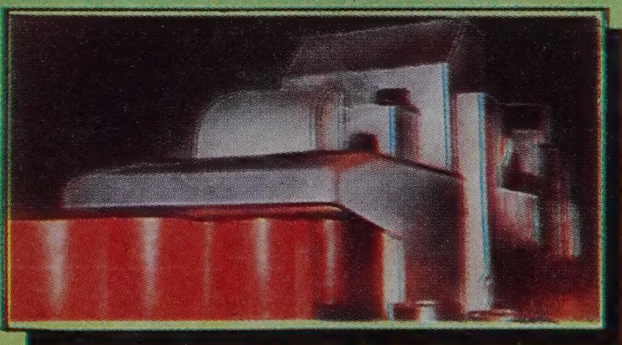
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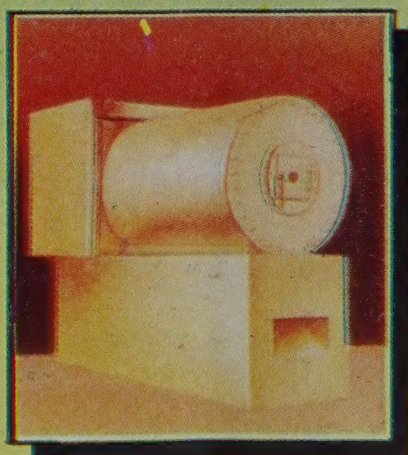
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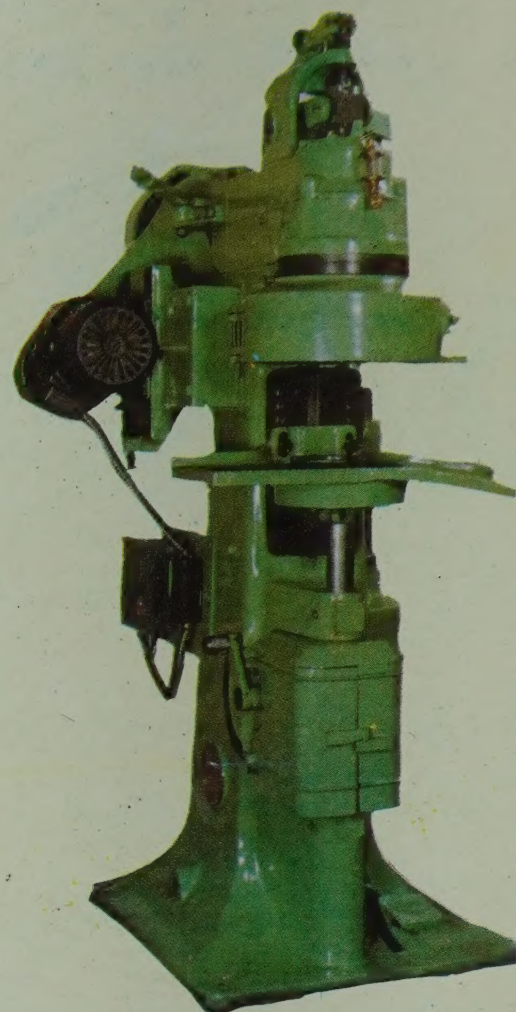
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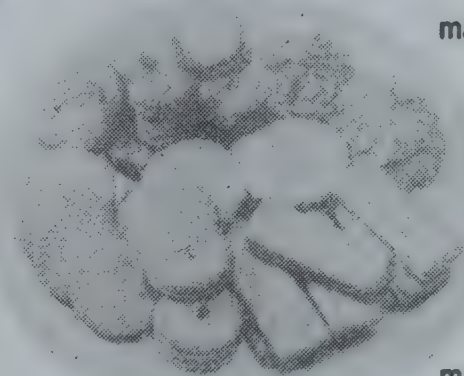
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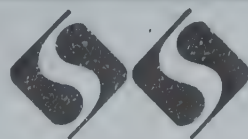
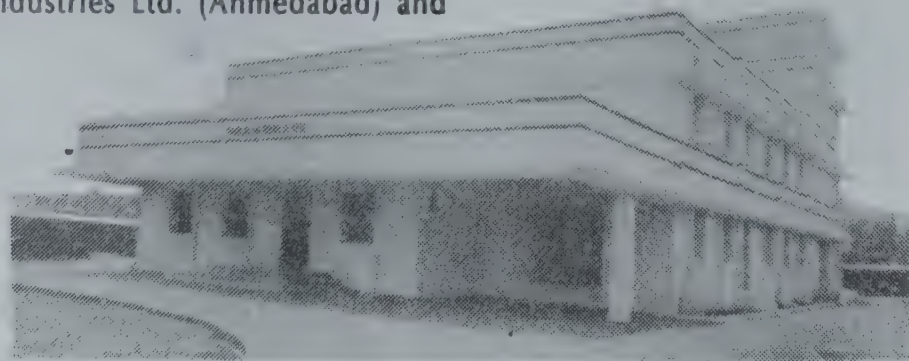
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Chemical Studies On Kishk as an Iraqi Fermented Milk - Wheat Food

by

Dr. J.M. Jandal

Department of Animal Science, College of Agriculture, University of Tikrit, Tikrit, Iraq

Abstract

Kishk, a milk - wheat fermented food, is a common product in some Arab countries which is prepared from fermented milk with grained boiled wheat. The chemical studies showed the average percentage of acidity, moisture, total solids, fat, free fatty acids, total nitrogen, total protein, soluble nitrogen, soluble protein, carbohydrates, galactose, fibres, glycolipids, ash, sodium chloride, calcium, magnesium and phosphorous besides volatile flavour compounds such as formaldehyde, acetal-dehyde, acetone, acetoin, diacetyl and ethanol in mg per 100 gm of samples were 2.85, 7.30, 92.70, 8.82, 33.20, 3.71, 23.67, 1.15, 7.35, 49.80, 1.42, 2.83, 6.98, 8.32, 7.68, 0.32, 0.04, and 0.28 respectively besides 0.10, 0.15, 0.13, 0.21, 0.32 and 0.38 respectively. These results suggest that this product is rich in its nutritional constituents. So it can be considered an ideal food for human beings and has good keeping quality as compared to milk and other fermented milk products. Thus it can be produced in large scale and more hygienic to meet the demand for milk in those countries where climate conditions reduce the production of milk or can be produced from butter making during the surplus milk in spring and summer seasons which can be used during the shortage of milk.

Introduction

Kishk, a milk - wheat fermented food, is a common product in Iraq, Syria, Palestine, Jordan, Lebanon and Egypt, and similar product "Trahana" which is popular in Turkey and Greece (Koksal, 1961). In Middle-East, South-East Asian and African countries where high ambient temperature pose a real problem in milk storage and where lactic fermentation of milk also can afford limited shelf-life at room temperature more practical ways was adopted and found suitable by natives involve drying of concentrate fermented milk with grained boiled wheat (bursal) after fermentation. This is uncontrolled fermentation process, which results into kishk. These processes are usually carried out during surplus milk when the atmo-

spheric temperature is at its highest (Jandal, 1988). It is prepared from whole milk, skimmed milk or butter milk. These processes were refined by Robinson in preparing yoghurt kishk. Hamad and Fields (1982) also gave a new type of kishk made with whey. This product is normally consumed with bread after cooking by reconstituting the dried product with water. Flavouring agents such as chopped onion and / or chopped coriander are added to the cooking kishk.

There is no report available regarding the chemical composition of kishk in Iraq. The purpose of this study is to find out its chemical composition in order to be recommended as an ideal food for human being consumption due to economic inhibition.

Material and Method :

Kishk samples were collected from different areas. These samples were analysed for acidity, total solids, total and soluble nitrogen, total and soluble proteins, fat, free fatty acids, carbohydrates, crude fibres, sodium chloride, calcium, magnesium, phosphorous, galactose, formaldehyde, ethanol, acetaldehyde, acetone, acetoin and diacetyl as described in SP: 18 (part - XI) - 1981. The glycolipids were estimated as described by Raghuramulu *et al* (1983).

Results and Discussion :

The composition of kishk is shown in the Table. It is apparent from the table that the average acidity was 2.85% as lactic acid. The high value of acidity was due to the lactic acid fermentation taking place as a result of activities of various lactic acid bacteria during production and storage on its lactose.

It is clearly seen from the table that the moisture content of the product varied within a wide range, the lowest being 6.24% and the upper is 8.50%, with an average of 7.30%. It could be shown that the differences between the moisture content of different results are very high. This is due to the fact that kishk was dried by different

Table : Chemical composition of kishk *

Component	Range	Average
Acidity %	2.30 - 3.46	2.85
Moisture %	6.24 - 8.50	7.30
Total Solids %	91.50 - 93.76	92.70
Fat %	6.34 - 9.86	8.82
Free fatty acids %	25.33 - 39.20	33.20
Total nitrogen %	3.15 - 3.85	3.71
Total protein %	20.10 - 32.80	23.67
Soluble nitrogen %	0.84 - 1.26	1.15
Soluble protein %	5.31 - 8.04	7.35
Carbohydrates %	46.20 - 52.54	49.80
Galactose %	1.50 - 1.85	1.42
Glycolipids %	5.60 - 8.78	6.98
Fibre %	2.43 - 3.19	2.83
Total Ash %	7.80 - 9.84	8.32
Sodium chloride %	6.94 - 8.85	7.68
Calcium %	0.29 - 0.34	0.32
Magnesium %	0.03 - 0.05	0.04
Phosphorous %	0.22 - 0.32	0.28
Formaldehyde mg %	0.09 - 0.11	0.10
Acetaldehyde mg %	0.11 - 0.17	0.15
Acetone mg %	0.12 - 0.15	0.13
Acetoin mg %	0.20 - 0.23	0.21
Ethanol mg %	0.28 - 0.35	0.32
Diacetyl mg %	0.23 - 0.43	0.38

* data are average of six samples.

ways (sun drying). The high moisture content and low level of total solid explain the short keeping quality of this product.

It is also seen from the table that the total solids content varies from 91.50% to 93.76%, with an average of 92.70%. This low level of total solids affect the nutritive value of this product and its keeping quality. The results of the present study are in agreement with the findings of Cadena and Robinson (1979) ; El-Sadek *et al* (1959) and Frankul and Pellett (1959) who reported 92.20%, 92.05% and 92.60% respectively.

The fat content of kishk, as it appears from the table varied considerably, the lowest being 6.34% and the highest 9.86%, with an average of 8.82%. These variations might be depending on whether the product has been made from whole cow milk or partially skimmed milk or butter milk. The present findings are not in agreement with the findings of EL-Sadek *et al* (1988) and Cadena and Robinson (1979) who reported 6.86% and 6.90% respectively, but the

results are in agreement with the findings of Frankul and Pellett (1959) who reported 8.60%. The free fatty acids content of kishk as shown in the Table ranged from 25.33% to 39.20%, with an average of 33.20% of fat. This high value percentage in free fatty acids may be attributed to the lipolysis of various bacteria lipase associated with the fermentation occurring during its manufacture or storage period.

It is clear from the Table that the total nitrogen in kishk examined samples varied from 3.15% to 3.85%, with an average of 3.71%. The variations may be attributed directly to variation in the compositional quality of the ingredients used in making it. EL-Sadek *et al* (1958) reported lower (2.00%) total nitrogen as compared to the present study (3.68%). The protein level ranged from 20.10% to 32.80%, with an average of 23.67%. These wide variations in protein content might be attributed directly to variations in the preparation and compositional quality of the ingredients. It may be noted that the relatively high total protein level suggests a high nutritive value. Earlier, the values, ranging from 13.43 to 17.40% for total protein in the kishk have been reported by EL-Sadek *et al* (1958); whereas Cadena and Robinson (1979) reported slightly lower total protein level (23.50%) as compared to the present study. The increase in the protein level in the present study might be due to the difference in the species, analysis method, conditions in which analysis was carried out.

The soluble nitrogen varied from 0.84 to 1.26%, with an average of 1.15%. The results indicate that proteins of kishk were susceptible to proteolysis during manufacturing and storage period. This high value may be attributed to the proteolytic action of various bacteria and other organisms associated with the fermentation taking place during its preparation and storage period. The present findings (1.00%) is quite different from the findings of EL-Sadek *et al* (1958) who reported 0.434%.

The carbohydrates level varied from 46.20 to 52.54%, with an average of 49.80%. This high level of carbohydrates may be attributed to the wheat which is used in its manufacture, owing to the fact that wheat is the source of most of the carbohydrates in the kishk, because the lactose level is not more than 5% in milk. The present findings (49.80) is not in agreement with the findings of Cadena and Robinson (1979) who reported 59.00%. While the galactose ranged from 1.50% to 1.85%, with an average of 1.42%. Its presence in kishk might be attributed to hydrolysis of lactose into glucose and galactose by lactic acid bacteria.

The glycolipids level varied from 5.60 to 8.78%, with an average of 6.98%. This high level might be attributed to the loosely bound lipid material to the carbohydrates especially galactose which produce due to the hydrolysis of lactose by the action of lactic acid bacteria and fermentation process during storage period. The variations in the level of glycolipids in the present study might be either due to differences in the method of preparation or due to the compositional quality of the ingredients used in this product.

The fibre level of kishk was 2.43 to 3.19%, with an average of 2.83%. This value is due to the wheat which is used in its making. The findings from the present study regarding the fibre level is in agreement with the findings of Cadena and Robinson (1979) who reported 2.50%.

Total ash, sodium chloride, calcium, magnesium and phosphorous were ranged from 7.80%, 6.94%, 0.29%, 0.03% and 0.22% to 9.84%, 8.85%, 0.34%, 0.05% and 0.32% respectively. The high level of total ash and its constituents are no doubt due to the salt added during the preparation.

It was also seen from the Table that volatile flavour components such as formaldehyde, acetaldehyde, ethanol, acetone, acetoin and diacetyl levels were varied from 0.09 to 0.11, 0.11 to 0.17, 0.12 to 0.15, 0.20 to 0.23, 0.28 to 0.35 and 0.23 to 0.43 mg per 100 gm of sample respectively. These components are primarily responsible for the typical and desired flavour and / or aroma of this product. This presence of volatile flavour compounds might be due to lactose fermentation taking place during fermentation.

Conclusion

From the above data, it can be concluded that this product can be considered an ideal

food for human beings and has good keeping quality as compared to milk. It can be produced in large scale instead of production in very limited scale and more hygienic to prevent the contamination with pathogenic bacteria. This study suggests that this product is rich in its nutritional constituents.

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Composition of Biscuits Containing Soy by-Products

by

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Abstract

Biscuits prepared using 6 per cent level of three soy by-products viz, soy residue with or without hulls and hulls alone, in the formulation have been evaluated for their proximate composition as well as acid detergent and neutral detergent fibre content. Among the three preparations, products containing soy residue without hulls exhibited maximum amounts of protein and fat whereas those containing hulls contained maximum content of crude fibre, acid detergent fibre and neutral detergent fibre. In general, there was significant increase in the contents of acid detergent fibre and neutral detergent fibre in biscuits on inclusion of all the three byproducts in the formulation.

Introduction

Soy industry is gaining more and more importance these years on account of increasing demand for soy refined oil, defatted soy flour and soy chunks. A number of by-products such as soy residue and hulls are obtained in the processing of soybeans into various products.

Soy residue (okara) is obtained in the process of soy milk manufacture while hulls are obtained during dehulling of beans. These by-products are rich in fibre and are usually discarded. With a view to explore possible food uses, studies were initiated on their inclusion in biscuits which are low in fibre content (Kumar et al, 1994). The study suggested modification of formulation to improve the quality characteristics of products. Incorporation of soy residue (with or without hulls) or hulls at a level of 6 per cent in the formulation did not alter the sensory attributes of the products and required only minor modification in the formulation. The present study reports chemical characteristics of biscuits containing different by-products of soy industry.

Materials and Methods

White flour (maida) was purchased from local market whereas soy residue (with and without hulls) and hulls were obtained as per method described earlier (Kumar et al, 1994). Biscuits were prepared from white

flour (control) and blends of white flour and soy residue (with or without hulls) or hulls (94.6 by weight) by the procedure of Whitley (1970). Baking powder and skim milk powder were used at 0.5 and 2.0 per cent level respectively in the formulations based on blends.

Proximate constituents of biscuits were determined according to AACC (1976) procedures whereas the contents of acid detergent fibre and neutral detergent fibre were estimated by the method of Goering and Van Soest (1970). Energy content of biscuits was computed by using appropriate conversion factors for carbohydrates, fats and proteins. (Mudambi and Rajagopal, 1983).

Results and Discussion

The proximate composition and fibre content of biscuits prepared using soy residue and hulls in the formulation is given in Table 1. Biscuits prepared using soy residue (with or without hulls) contained greater amounts of protein and crude fibre whereas biscuits prepared using 6 per cent hulls exhibited lesser protein and fat content

than the control. The latter had the maximum contents of crude fibre, ash and total carbohydrates. Biscuits containing soy residue without hulls contained highest amounts of protein and fat but lowest amounts of ash and carbohydrates. The data also show that crude fibre content of biscuits increased from 0.61 per cent to 0.77 - 1.7 per cent upon addition of soy residue or hulls in the formulation. The contents of protein and fat were marginally lowered when only hulls were incorporated in the biscuit formulation.

The control biscuits had a minimum of acid detergent fibre (0.95 per cent) as well as neutral detergent fibre (9.45 per cent) whereas biscuits containing 6 per cent hulls contained maximum amount of both the type of fibres. It would also be seen from Table 1 that biscuits containing soy residue without hulls had intermediate values. Apparently, presence of hulls was more important in increasing the values of acid as well as neutral detergent fibres.

Nutrients supplied by one serving of biscuits (30 g) are presented in Table 2. Product prepared using soy residue at 6 per

Table 1 : Composition of high fibre biscuits*

Constituent	Control Biscuits	Biscuits containing soy residue with hulls	Biscuits containing soy residue without hulls	Biscuit containing soy hulls
Protein, %	8.4	9.1	9.4	8.1
Fat, %	18.5	18.1	18.9	17.4
Crude fibre, %	0.6	1.0	0.8	1.7
Ash, %	1.2	1.1	1.2	1.2
Carbohydrates, %	71.3	70.7	70.0	71.5
Acid detergent fibre, %	0.95	1.7	1.4	2.7
Neutral detergent fibre, %	9.45	11.00	10.80	11.84

* Values expressed on dry weight basis

Table 2 : Nutrients supplied by one serving (30 g) of various biscuits

Constituent	Control Product	Product containing soy residue with hulls	Product containing soy residue without hulls	Product containing hulls
Protein, g	2.45	2.63	2.72	2.36
Fat, g	5.40	5.23	5.48	5.09
Crude fibre, g	0.18	0.29	0.22	0.50
Ash, g	0.35	0.32	0.35	0.36
Carbohydrates, g	20.81	20.40	20.14	20.89
Acid detergent fibre, g	0.28	0.49	0.41	0.79
Neutral detergent fibre, g	2.76	3.17	3.12	3.46
Energy, K Cal.	141.64	139.19	140.76	138.81

Contd. on Page No. 16

Production Of Bitter Peptides In Cheese

by

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One of the most important products of milk produced by fermentation is Cheese. The importance of this product is due to its nutritive value, digestibility and flavour. The flavour in cheese is due to production of compounds, due to breakdown of Protein, Fat, Lactose etc. during fermentation or ripening but sometimes there is production of negative flavour precursors which effect its acceptability. The most important and prevalent off flavour in cheese that usually occurs due to poor production process is bitterness. Bitterness in cheese is due to high concentration of bitter peptides produced from casein. The proteolytic enzymes play an important role in formation and degradation of bitter peptides from calf rennet and from starter bacteria.

Bitter peptides appears to be produced from casein by the action of rennet or chymosin as well as of proteinases from the cellwall of certain starter bacteria. Degradation of bitter peptide precursors by the action of proteolytic enzymes from the cytoplasmic membrane from the bacterial cell either in concert with enzymes from the cytoplasm or without their aid. A bitter peptide mixture is completely debittered by incubating it with a proplasm enzyme fraction, isolated either from a bitter or from a non-bitter fraction.

Bitterness is an important part of some of the varieties of cheese. The quantity of bitter compounds below threshold value in cheese, is desirable. Above threshold value in cheese is not appreciated. According to earlier reports, bitter components are originated from alpha-S₁ Casein, however, recent reports have indicated that the bitter compounds originate from beta-casein. Cheddar cheese made from buffalo milk used to be criticized for bitterness.

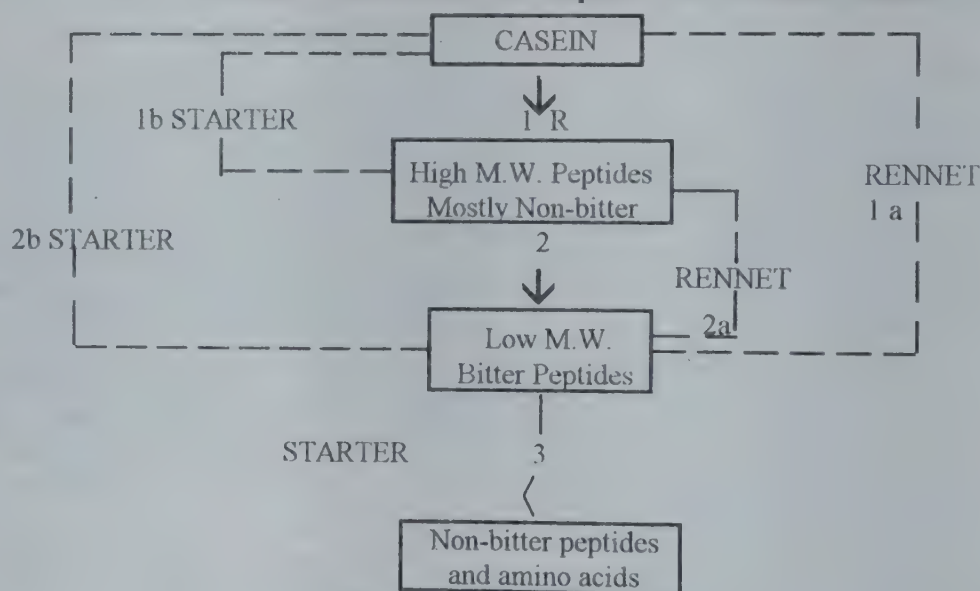
According to Sullivan and Jago (1970), the bitterness resulted from the formation of pyrrolidone - Carboxylic acid (PCA) at the N-terminal end of hydrophobic peptides derived from casein during proteolysis. PCA is a cyclic form of glutamic acid, an amino acid common to all the bitter peptides, and is readily formed by heating the usual form of the acid. It was further suggested that non-bitter cultures may possess the enzymes pyrrolidone - carboxyl peptidase to hydrolyse the peptide bond

joining PCA residues to the remainder of the peptides and proteins.

The bitter peptides, isolated from enzyme hydrolysates of casein, contained a high content of proline, and in one instance, dispersed along the peptide chain was supposed to make the peptide resistant to normal endo-and exo-peptidase attack and N-terminal pyrrolidone-carboxyl residue to effectively block normal amino peptidase activity. Thus, the resistance of these peptidases to enzymic hydrolysis will tend to result in their accumulation in dairy products. A model suggested by Lonnie and Lawrence (1972) for development of bitterness in Cheddar cheese is given below:

was often found to be bitter. Starter cultures in milk to which rennet has been added turned out to acquire an extremely bitter taste after a short incubation time at room temperature. The best proof that rennet in cheese can produce bitterness follows from experiments with starter-free cheese, whereby the acid formation was stimulated by the addition of δ -gluconic acid lactose. Bitter peptides were found in these products. This was already the case where cheese was made in which a certain amount of rennet (a quantity normal for Gouda cheese) was retained. When 60% of this amount was retained (normal for cheddar cheese), a slight bitter flavour developed. One would be inclined to deduce from these findings that rennet is capable

1. Model for bitterness development in Cheddar cheese



— Most Important Pathways

----- Less Important Pathways

1. Casein Degradation by Rennet. 2. Hydrolysis of High MW Peptides by PROTEINASES of starter streptococci. 3. Degradation of low MW Peptides and Aminoacids by peptides of starter streptococci.

1a. With Rennet. 1b. Without Rennet, Enzymes produced by starter culture

2a. With Rennet 2b. Without Rennet, Enzymes produced by starter culture

Factors Influencing Production Of Bitter Peptides In Cheese

There are wide variety of factors that influence the production of bitter peptides in cheese. Research is still going on to probe for other factors. Some of the important factors are discussed below -

1. Influence of Rennet :

It has long been established that rennet is able to produce bitter peptides from Casein. Cheese made with excess of rennet

of a direct production of bitter peptides in cheese. Some investigators also prepared cheese with different amount of rennet by reducing the amount to a value considerably below the normal one (0.22 ml standard rennet per litre of cheese milk). The bitterness of the cheese prepared with bitter starters, such as streptococcus cremoris HP, was decreased. No bitterness could be evoked by an increase of two to three times the normal amount of rennet when using non-bitter starters such as *S. cremoris* AM. From these findings it was concluded that

major role of calf rennet is not to form bitter peptides directly but rather to provide non-bitter peptides which are subsequently degraded to bitter ones by bitter starters. However the fact that a non-bitter cheddar cheese can be produced, even when a three-fold excess of rennet is used in combination with a non bitter starter, is probably due to the relatively low amount of rennet retained in this kind of cheese. Cheese, when produced under these circumstances appeared to be very bitter. Apparently rennet can produce bitter peptides on its own in cheese.

The importance of the amount of rennet retained in the cheese for the development of bitter flavour was already emphasized. This amount is not only governed by the amount and type of rennet added to the cheese milk but also by the manner in which the curd is washed and drained, by the pH of the milk and curd during cheese making and in particular by cooking temperature. The lower the pH and lower the cooking temperature, higher is amount of rennet retained in the cheese.

Influence of Starter Bacteria :

(a) Relation to the degradation of bitter peptides

The degradation of bitter peptides is certainly of significance, follows from the observation that the intensity of bitter flavour can diminish during ripening. Starter free cheese is bitter due to the formation of bitter peptides by rennet. Since normal cheese containing both rennet and starter bacteria is generally not bitter, degradation of bitter peptides in cheese is obvious. The ability of bitter strains to degrade bitter peptides in cheese is probably smaller than of non-bitter ones.

It is not yet identified as to which part of the proteolytic system of starter streptococci is responsible for the degradation of bitter components, also whether in bitter strains the degrading enzymes are absent or restricted in their activity. In an experiment with cell free extracts, Sullivan *et al* (1973) found indications that both in 'non bitter' and in bitter strains degrading enzymes are active at neutral pH but that at pH 5.0, the degrading enzymes are less active.

In an experiment, Gouda cheeses were prepared with a bitter strain as starter. In addition to this starter, cell suspension of 'bitter' and non-bitter starter strains and of their slow variants were added to the cheese milk. In some case the cell had been treated with butanol. Butanol treatment of streptococci results in permeabilization of the membrane from an activity restricting lo-

cation. The results of some of the experiments were found to be significant regarding this.

(b) Relation to the formation of bitter peptides :

It is now well established that certain starter bacteria are capable of forming bitter peptides. The bitterness of cheese is linked with the choice of the starter which had been confirmed and applied in practice, although it must be emphasized that not only formation but also degradation of bitter peptides determines if and to what extent the cheese will become bitter.

Investigators observed that certain strains known to be 'Non-bitter', do not develop very well if cooking temperatures of 30-39°C are used, and consequently reach lower final number in the cheese than do certain strains known to be 'bitter' ones. This valuable observation may lead to a proper selection of strains and in this way to an effective prevention of bitter flavour in certain cheese varieties such as Cheddar. However the fact that all starters are potentially able to produce bitter and non-bitter cheese, cannot be deduced from these observations. Neither can it be concluded that the response of each starter to higher streptococci in the cheese and consequently include the likelihood that bitterness will develop. One of the arguments against this conception comes from the experience that, whereas the cooking temperature used in Gouda cheese manufacture is mostly 34°C or lower, the starter culture also clearly affects the development of bitter flavour.

Visser *et al.* (1987) developed a method in which rennet free cheese was manufactured in an aseptic way. With the bitter strain HP, Z₈ and WG₂ as starter, these cheese turned out to be bitter. In the corresponding, aseptically made cheese with the same strains as starter but the normal amounts of rennet, the bitter flavour was found to be more intensive. This cumulative effect indicates a concerted but separate action of rennet and certain starter bacteria in the formation of bitter peptides in the cheese.

It is now well known that in a culture of fast variants, slow variants may be formed which have lost their capability to synthesize cell wall proteinase. The cell wall proteinases of bitter strains are able to form bitter peptides from casein. Slow variants of such strains have lost this ability. As a practical consequence it follows that bitter strain is used as starter in

which the slow variants have grown to a large population of the culture.

Influence of conditions during cheese making and cheese ripening :

Many of the factors that affect the bitter defects have already been discussed. They are : the pH of the cheese milk and the curd during cheese making, the choice of the starter, the amount of rennet and starter added to the cheese milk, the cooking temperature, the manner of draining the curd. It was seen that non-bitter *S. cremoris* strains ML-1 and E-8 are able to produce in milk at pH 4.3 as many bitter peptides during incubation of 6 days at 30°C as the bitter strains HP and C13. It was further observed that in non-bitter cultures in milk, maintained at pH 5.3, the bitter peptides did not accumulate whereas they did in bitter cultures.

The cooking temperature also influences bitterness from experiments with Gouda cheese. It appeared that this cheese, when ripened at 36°C (normal temperatures are 12°C -13°C) had a somewhat more bitter flavour than cheese ripened at 6°C. Later it was found that at ripening temperature of 18°C and 15.5°C, the risk of bitterness occurring is greater than at normal ripening temperature. As in manufacturing these cheeses, a cooking temperature of 35°C or lower is commonly used, the difference between bitter and non-bitter Gouda cheese cannot be explained by the resistance or sensitivity of starter bacteria to higher cooking temperatures. The bitter and non-bitter strains may sometimes be equally sensitive in this respect. The proteolytic system of the starter bacteria is therefore also involved.

The higher the cooking temperature during cheese making, the less rennet is found in the cheese and the bitter flavour in cheese is less intense.

Above cooking temperatures of 35°C (35-39°C), in addition to the reduced rennet content, the decreased maximum number of streptococci and the decreased content of their proteases producing bitter peptides may also be considered to be the cause of the reduced bitter flavour. At cooking temperatures < 35°C, however, the lower content of rennet is probably to be considered as the only reason for the less bitter flavour. In general cheese made from high temperature pasteurized milk has a greater chance of becoming bitter than cheese made from low temperature pasteurized milk.

Effect of Salt :

Salt reduces the intensity of bitter

flavour in Gouda cheese. The higher the salt content, the lower the score of bitter flavour. The possibility that salt retards the formation of bitter peptides by inhibiting the enzymes from rennet and starter bacteria that are responsible for this formation or by preventing the casein components (β casein) from being attached by these enzymes, can be only part of explanation. The increased salt content could also make bitter flavour because of the taste of the salt itself. In the experiments made to study the effect of salt on the development of bitter flavour, the cheeses were not estimated directly for bitter flavour after ripening. In order to exclude a masking effect on bitter flavour because of the salt itself, pastes were made from various cheeses in a mortar. The salt content of each paste was determined, after which all salt contents but one were raised to the highest values found. The intensity of the bitter flavour of the pastes was then estimated.

Tentative scheme for the formation and breakdown of the bitter peptides in cheese:

Reaction - I

Paracasein Proteases of the starter bacteria : Bitter peptides

Paracasein ~~Rennet~~ \rightarrow Polypeptides Proteases of the starter bacteria \rightarrow Bitter peptides are influenced by :

Starter —proteolytic systems of the starter bacteria
—proportion of the slow and fast variations
—cooking temperature.

-Number of starter bacteria
—cooking temperature
—activity of the starter
—milk infection by phage
—penicillin

-Rennet
— Type of rennet
—content-cooking temperatures
—Amount of rennet added to the cheese milk
—pH during manufacture - amount of starter
—activity of starter
—milk

-activity of —Salt content of the proteases cheese
—moisture content of the cheese
— pH of the cheese
—ripening temperature of the cheese

Reaction - II

Bitter peptides proteolytic enzymes of

Effect of Salt on the formation of bitter flavour * in Gouda cheese :

Experiments	Starter	(Salt in dry matter (%))	Intensity of bitter flavour			
			(6 weeks)	(2 months)	(3 months)	(4 months)
1.	S.cremoris HP	3.76 2.07 0.10	1.8 2.0 3.2			
2.	S. cremoris TR	2.53 0.10			1.3 2.3	
3.	S.cremoris	2.62 0.10			1.2 1.5	
4	S.cremoris HP	3.43 0.12		1.9 3.0		

* The intensity of the bitter flavour was estimated in paste that had been made from various cheese. The salt contents of the paste had been raised to the highest value determined. ** Scale 0-4

the starter bacteria \rightarrow non bitter peptides

influenced by :

—the proteolytic system of the starter bacteria —They may differ in system capable of degrading bitter peptides.

Conclusion :

There is production of various bitter peptides during production of different cheese under different conditions. Higher proteolysis reduces its acceptability, so far improving the organoleptic quality of cheese in terms of bitterness, the hydrolysis and subsequent isolation of the bitter peptides can be followed by a typical positive cheesy flavour. The investigations are being conducted to get into more depth of the complexity of the bitterness defect in cheese.

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Composition of Biscuits ...

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cent level provided greater amounts of protein, crude fibre, acid detergent fibre and neutral detergent fibre than the control. Among the three products containing soy by-products, the one containing only hulls had minimum of protein, fat and calories. There was significant increase in the contents of acid detergent fibre as well as neutral detergent fibre of biscuits where soy residue or hulls were incorporated in the formulation.

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Factors Affecting Rice Bran Oil Expression - A Review

by

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Abstract

The pertinent properties affecting the flow of oil through the porous body of bran are particle size, sample bed thickness and degree of porosity which in turn is dependent on bulk density, moisture content and presence of hull content in bran. The machine operating parameters viz. applied pressure and pressing time are also important to understand the mechanism of rice bran oil expression employing hydraulic pressing. The relevant literature is reviewed and reported in this paper.

Key words: Rice bran, hydraulic pressing, properties of bran, expression of bran oil.

Introduction

Rice bran is a by-product obtained during milling of paddy. It includes the pericarp, seed coat, nucellus, aleurone layer, germ and variable portions of the sub aleurone layer of the starchy endosperm depending on the extent of polishing. Bran accounts for 5 to 8 per cent by weight of rough rice milled (Houston, 1972). Raw rice bran contains, on an average, 10 to 18 per cent oil, while parboiled rice bran contains 20 to 28 per cent depending on paddy varieties.

Juliano *et al.* (1985) have rightly pointed out that the knowledge of the structure and composition of rice grain is essential for the understanding of the technology of rice and its by-products processing. The aleurone layer has protein and lipid bodies. Lipid bodies are apparently not bound by a typical bilayer membrane, are homogeneous, and are able to coalesce with one another following mechanical damage to the grain. The aleurone may be one to seven cells thick and is thicker on the dorsal (back) than along the lateral and ventral (front embryo side) surfaces. The presence of globoides in aleurone layer has been confirmed, as has the presence of crystalline protein bodies in the subaleurone layer with the lipid bodies. Lipids are present in the form of sphaerosomes or lipid droplets < 1.5 μm in diameter in the aleurone layer, < 1 μm in the subaleurone layer, and < 0.7 μm in the embryo of rice grain (Juliano, 1985).

In brown rice the fat content has been reported to be in the range of 2.4 to 3.9 per cent (Juliano *et al.*, 1964). A number of research workers have confirmed that the lower content of fat in milled parboiled rice, although the total fat in brown rice has been found to remain more or less unchanged. Mahadevappa and Desikachar (1986) showed that in brown rice, the oil mostly occurs in the aleurone and germ as discrete oil globules, but these are disrupted and transformed into a band after parboiling. Consequently, the oil content of parboiled rice bran has been repeatedly shown to be more than that of raw rice bran. Thus the higher oil content of bran of parboiled rice could be due to less endosperm contamination and outward movement of fat within the aleurone and germ cells (Vasan *et al.*, 1971). Mukherjee and Bhattacharjee (1978) studied the distribution of oil in milling fractions of long, medium and short types of raw and parboiled rice, using Satake abrasive mill. They stated that the highest oil content was in the bran from long grain (IR-22, 21 % oil at 5% polished) and the lowest in the bran from short grain (Bala, 13 % oil) varieties. Parboiling increased the oil yield of bran in all the varieties, but much more for the medium grain. The results indicated that the oil was more concentrated in the surface layers of slender and short grain varieties and more or less evenly distributed in the bran layers of the medium grain variety.

Physical Properties

The knowledge of physical properties of rice bran is central to various processing operations including oil expression viz. particle size, density and porosity.

Particle size: Sieve analysis is the most common method used for the analysis of particles and is suitable for the size range of 0.075 to 3.000 mm approximately (Henderson and Perry, 1966). Srivastava (1976) observed that the parboiled bran has larger particle size (0.32 mm) compared to raw rice bran (0.26). Barber and Benedito de Barber (1979) have made comparative study of the sieve analysis data of the brans obtained from a friction type and abrasive type polishing machines and found that the former produced a bran of larger particle size as compared to the latter. Sahoo (1981) determined the average particle size, namely

mass mean diameter, arithmetic mean diameter and volume surface mean diameter of parboiled bran particles by differential sieve analysis and found to be 0.375, 0.351 and 0.367 mm respectively. Sreenarayanan (1983) observed these values for raw rice bran of 'Ratna' variety to be 0.269, 0.237 and 0.291 respectively.

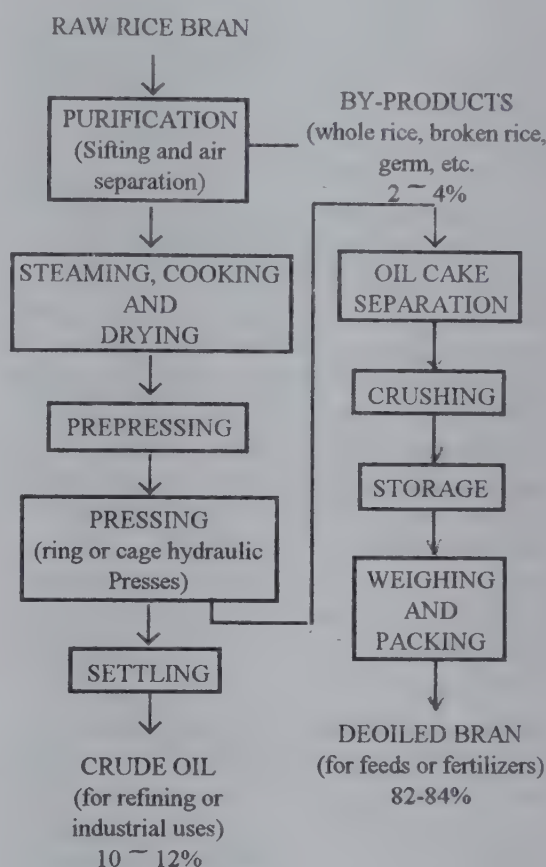


Fig. 1: Flow chart of the Rice Bran Oil Extraction processed by pressing in Japan

Particle density: Srivastava (1976) found that the particle density of raw bran decreased from 1.456 to 1.448 g/cm^3 when the moisture content increased from 8 to 14.1 per cent (wb), whereas, in the case of parboiled bran it decreased from 1.456 to 1.305 g/cm^3 for the same moisture levels. Sreenarayanan observed that the particle density decreased from 1.30 to 1.27 g/cm^3 when the moisture content increased from 10.76 to 15.50 per cent (wb) for raw bran. Further, it was reported that the particle density of bran at 10.76 per cent moisture content is higher than that of water, any further increase in moisture content naturally reduces its particle density. Both the workers adopted Air Comparison Pycnometer. Maharajnarain *et al.* (1978)

reported that the particle density as determined by toluene displacement method for raw rice bran of 'ratna' variety was 1.22 g/cm³ at both 10 and 12 per cent (wb) moisture content.

Bulk density and porosity: Srivastava (1976) measured the bulk density of raw rice bran increased from 0.277 to 0.291 g/cm³, when the moisture content increased from 8 to 14.3 per cent, for same moisture levels the bulk density of parboiled rice bran increased from 8 to 14.3 per cent, for same moisture levels the bulk density of parboiled rice bran increased from 0.267 to 0.313 g/cm³. Maharajnarain *et al.* (1978) observed that the bulk density of raw rice bran of 'ratna' variety decreased from 0.300 to 0.277 g/cm³ when the moisture content was increased from 10 to 12 per cent (wb). In general, it was observed that the smaller the particle size of bran, higher was its bulk density at all the moisture levels.

Srivastava (1976) found that the porosity of raw rice decreased from 81.3 to 79.5 per cent when the moisture content increased from 8 to 14.1 per cent, while for parboiled bran it decreased from 82 to 76 per cent for the same moisture levels. Maharajnarain *et al.* (1978) reported that the porosity increased from 75.35 to 77.29 per cent when the moisture content increased from 10 to 12 per cent (wb). Sreenarayanan (1983) reported that the porosity of raw rice bran decreased from 80.8 to 77.8 per cent as the moisture content increased from 10.76 to 15.5 per cent (wb).

The inconsistent results reported above on bulk density and particle density may be attributed to the inherent possibility of a large amount of variability resulting from the use of different varieties, polishing machines, per cent polish and moisture content. Besides, the authors did not use any standard statistical treatment for testing the significance or otherwise of the observed relationship.

Expression of rice bran oil

Mechanical extraction of vegetable oil is known as expression which is the separation of the liquid from a two-phase solid-liquid system by compression under conditions that permit the liquid to escape, while the solid is retained between the compressing surface.

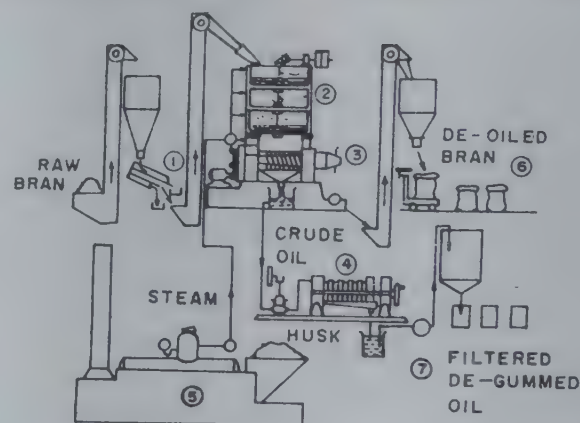
Raghunath Rao and Krishna Murty (1955) reported that cold-pressing of bran samples in Carver hydraulic press under a pressure of 13,440 psi (914.28 kg/cm²) could give a yield of 45 per cent of the oil present. Thirumala Rao *et al.* (1965) from a series of not so well designed experiments concluded that higher pressures of 5000 psi (340.14 mg/cm²) seemed to have very little

effect and indicated that more extensive investigations were required to confirm the same. The pressing time was kept constant at 1 h for each experiment, a rather long duration. Several essential details including sample size, the test cell geometry (the die used for oil expression from rice bran) etc., were not described. The results indicated that at 5000 psi (340.14 kg/cm²) pressure and at room temperature (25-30°C), the oil yield was 5 per cent by bran weight. At elevated temperatures (110°C), however, for the same pressure, the oil yield went upto 8.4 per cent on an average. Humidification of completely dried bran upto 8 per cent moisture level resulted in increased oil yield of 8.7 per cent of bran weight. In general, oil yields of 7-10 per cent were obtained from bran samples containing 17-19 per cent oil, 13-15 per cent from bran with 26.9 cent oil. Addition of moisture prior to pressing, resulted in cakes being firm and stony and it was suggested that such a pretreatment and passing the bran through expeller would solve the problem of 'fines' for the solvent extraction process.

Yokochi (1977) reported that the press-

ing method had been in use for many years in Japan and that the method was better for obtaining high quality crude oil and cakes for food and feed. However, the yields of oil were half of those obtained with solvent extraction methods. According to this mechanical method bran is steamed at 4-5 kg/cm² with a steam consumption of 350 kg/tonne of rice bran. In pre-pressing, a pressure of 70 kg/cm² is applied, while in final pressing, the lower and higher pressure are respectively 105 kg/cm² and 316 kg/cm². A flow chart of the process is given in Fig. 1. Yokochi (1976) reported the procedure for oil expression with the new type of oil expeller (Fig. 2) in which raw rice bran is initially sifted, steam cooked at 4-5 kg/cm² pressure and dried at 95-105°C temperature for 20-30 minutes to bring down the moisture content to 6-7 per cent. The pretreated bran is subjected to a pressure of 12,000 psi (816.33 kg/cm²) in an expeller (capacity - 300 kg/h and Power - 15 hp) for oil expression. The expressed oil is filtered through a filter press. The oil yield obtained was 8-12 per cent from the bran containing 18-19 per cent oil content.

Vasan *et al.* (1982) reported that par-



1. SIFTER 2. STEAM COOKER & DRYER 3. EXPELLER
4. FILTER PRESS 5. HUSK FIRED FURNACE 6. DE-OILED BRAN
7. RICE BRAN OIL

FIG.2. RICE BRAN OIL EXPRESSION BY EXPELLER

Table 1 : Results of oil obtained by hydraulic pressing of rice bran (Vasan *et al.* 1982)

Type of press	Oil content (%)	Pretreatment	Oil yield on weight basis (g/g)	Oil yield (%)	
				a	b
Hand operated hydraulic press	25.5	Cooked and dried bran, pressed at 170 kg/cm ²	130/1000	13	51
Hand operated hydraulic press	26.5	Cooked and dried bran, pressed at 204 kg/cm ²	120/1000	12	45
Electricity operated hydraulic press	27.0	Cooked and dried bran, pressed at 204 kg/cm ²	200/1750	12.1	44
Electrically operated hydraulic press	27.5	Cooked and dried bran, pressed at 204 kg/cm ²	130/1500	8.6	31

a : calculated on the basis of bran weight

b : calculated on the basis of initial oil content

boiled rice bran from the modern mill was sieved, cooked, dried and then pressed in a specially designed vessel (details are not described). Analysis of their data (Table 1) shows that they could get 51 per cent oil recovery on the basis of oil content in the bran.

Sivala (1983) could obtain an oil recovery of 45 per cent at 127 kg/cm² applied pressure for a duration of 45 min from parboiled rice bran. It was found that out of the five levels studied (50, 100, 150, 200 and 250 g) 100g bran sample gave the optimum cake thickness of 10 mm with minimum residual oil content. The initial bed height with 100 g sample was standardized to be 24 mm with the developed rice bran expression unit (Fig. 3) used on a 20 tonne hydraulic press.

It has been reported (Paddy Processing Research Centre, 1983) that by hydraulic pressing of rice bran, 50-60 per cent of the oil present in bran can be extracted by adjusting moisture content, temperature, particle size of bran and applied pressure at 8000 psi. The extracted oil containing less than 1 per cent FFA and the cakes can be stored well in polyethylene containers for more than six months without deterioration. The pressed bran could be sent to solvent extraction plants for further extraction of oil.

Tripathi and Kundu (1987) reported that the production of rice bran oil in China is around 90,000 tonnes of which 50 per cent is of edible quality. Two-thirds of the total rice bran oil produced, in China, is obtained either by the process of hydraulic pressing or by screw pressing (expelling). The process chart of hydraulic pressing of rice bran oil followed in China is shown in Fig 4. Raw rice bran as received fresh from the rice mills is cleaned, shifted and then roasted for about 10 minutes at a temperature of around 100°C in open shallow metal pans with constant stirring. The bran so treated is drawn into a steaming unit and steamed for a brief period. The steamed bran is compressed over a circular disc around 35 cm dia. This cake is subjected to a pressure of 100 kg/cm² by means of a ring type hydraulic press having dimensions of 679 x 800 x 2300 mm. The extracted oil is filtered through a conventional horizontal canvas filtering system. The oil is partially refined at the point of production and subsequently sent to refining units. The hydraulic press is fitted with 28 discs each with a holding capacity of 5 kg bran. Thus the capacity of one hydraulic press is 140 kg and the total operation time is 3 h. The colour of the oil obtained is light and FFA is less than 10 per cent. The oil recovery is around 10-12 per cent of bran weight. The residual oil is obtained by the solvent extraction process. The minimum oil content of rice bran cake for economical solvent extraction method was reported to be 10 per cent by weight (Takeshita, 1972, Yokochi, 1977 and Cornelius, 1980).

Sivala et al. (1991) made an investigation into the effect of moisture-addition on oil recovery from parboiled rice bran. The experiments were conducted based on response surface methodology to optimize the best treatment combinations of applied pressure, pressing time and moisture content for maximum oil recovery. A maximum oil recovery of 56 per cent was experimentally observed in the case of unsieved bran for a treatment combination of 18.6 MPa, 41.8 minute pressing time and 10 per cent moisture content. In case of sieved bran a maximum oil recovery of 48 per cent was observed for a treatment combination of 25.5 MPa, 35 minute and 11 per cent moisture content. Prediction equations were fitted to the experimental results. These indicated a maximum oil recovery of 55.9% and 50.4% for a treatment combination of 25.5 MPa applied pressure, 35 min pressing time and 10.5% (w.b) moisture content for both unsieved and sieved bran respectively. (Fig. 5a and Fig. 5b)

Sivala et al. (1992) developed a pilot hydraulic pressing unit

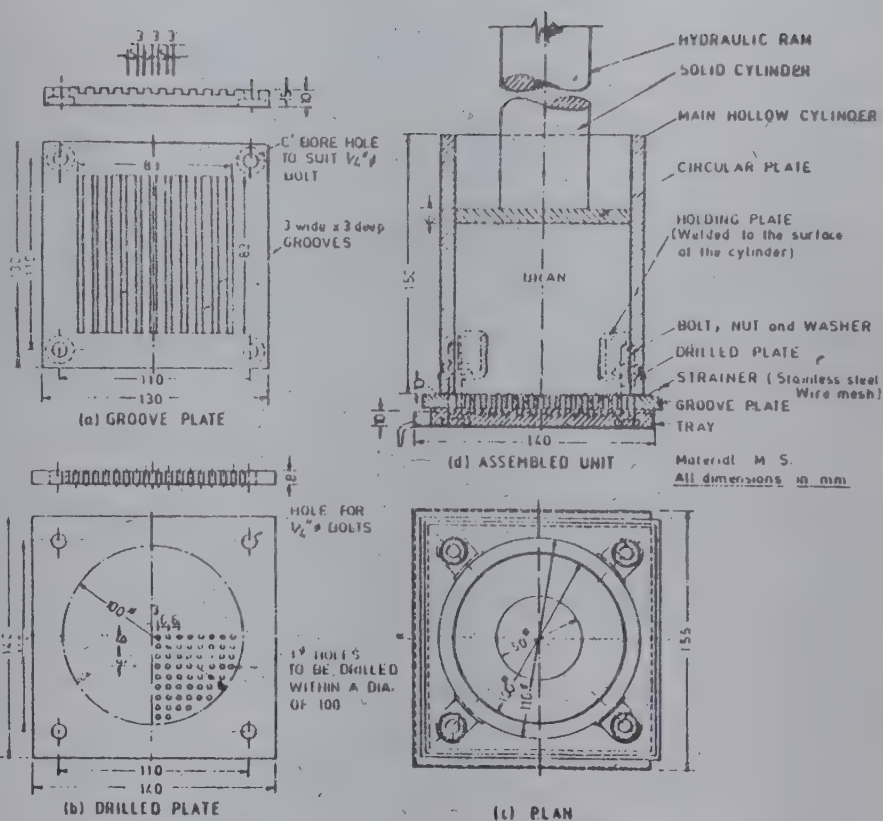


Fig. 3 Set-up for rice bran oil expression (from Sivala, 1983).

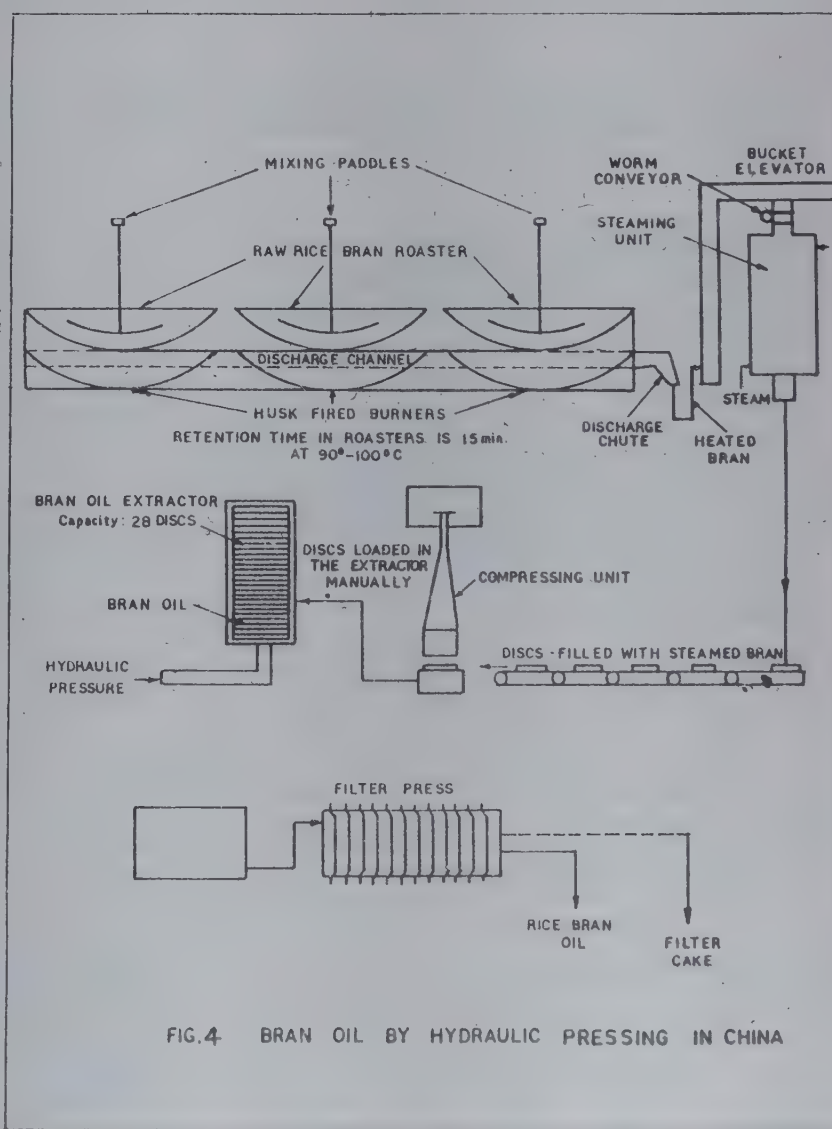


FIG.4 BRAN OIL BY HYDRAULIC PRESSING IN CHINA

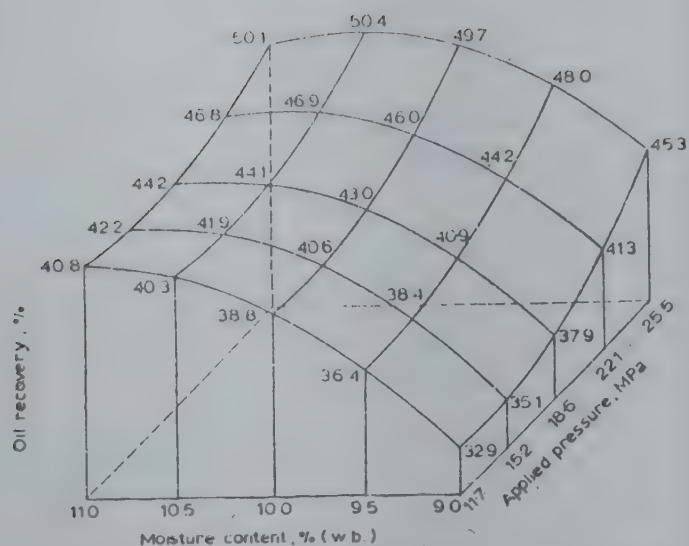


Fig.5. Response surface of oil recovery from sieved parboiled rice bran for a pressing time of 35 min

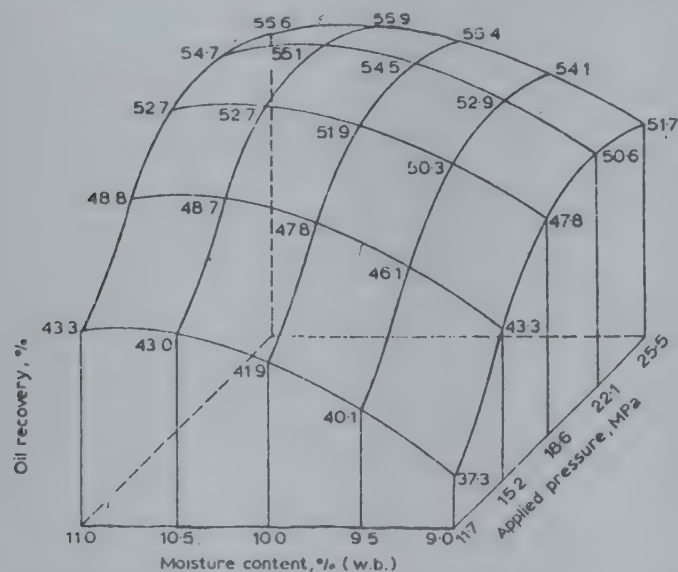


Fig.5a Response surface of oil recovery from unsieved parboiled rice bran for a pressing time of 35 min

for rice bran oil expression. The pilot press developed consists of five platens (200 mm x 200 mm) with temperature and pressure controls. Experimental results revealed that around 50 per cent of oil can be obtained from parboiled rice bran for pressing time of 35 min at a pressure of 20 MPa. This process technology could be extended to match with the bran production from 2 tonne per hour rice mill.

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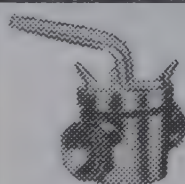
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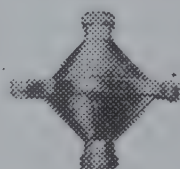
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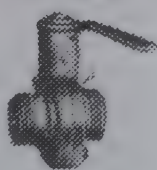
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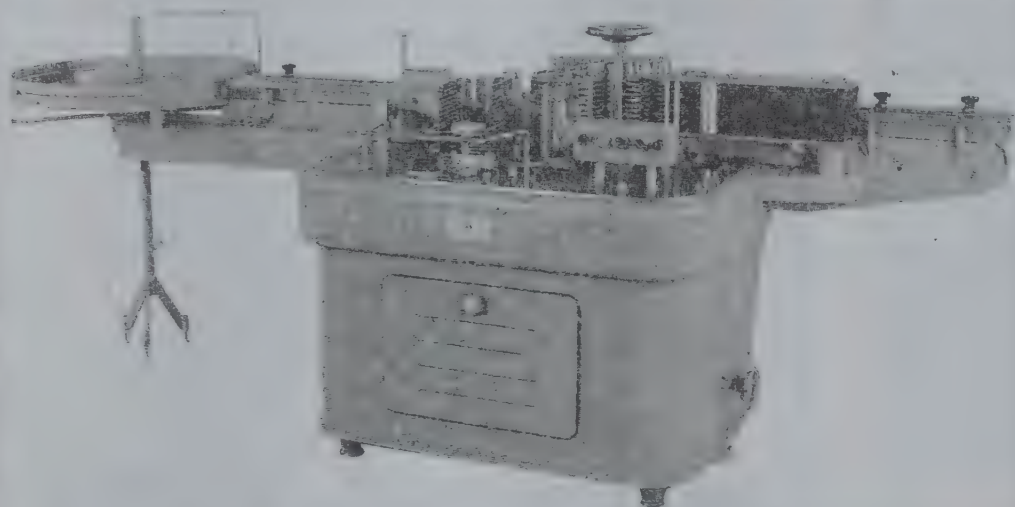
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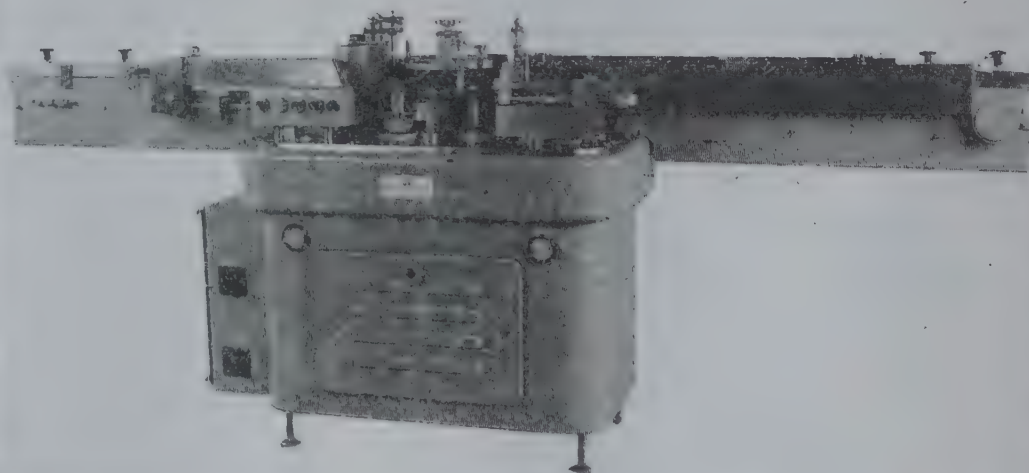
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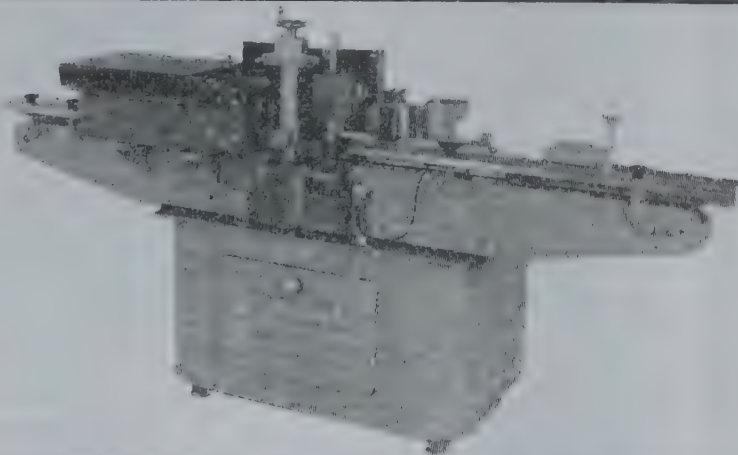
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Physico-Chemical Constant of Kangra Tea

by

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Abstract

In the present communication an effort was made to study the existing physico-chemical parameters and other tests in case of Kangra tea grown in Kangra valley and Mandi of Himachal Pradesh.

The study showed that there is no significant change in various physico-chemical characteristics v.z. Total Ash, Ash soluble in boiling water, Acid insoluble ash, Alkalinity of soluble ash, Crude fibre and Water soluble extract of Kangra tea.

Introduction

Tea is one of the most popular beverages and is consumed by nearly half of the world population. China was the first country to cultivate the tea plant. The word "Tea" originated from Tay used in the Chinese dialect; Amoy. In Cantonese it is known as chah a name travelled to India, Japan, Iran and U.S.S.R.¹

Kangra tea means tea derived exclusively from young leaves and unopened leaf bud of the plant *Camellia-Sinensis* and *Camellia-Thea* grown in only Kangra valley and Mandi of Himachal Pradesh in India¹.

Composition of Tea:

The more important constituents which gives tea its distinctive character as a beverage are caffeine, polyphenols (Tannin) and essential oil. These in combination with other constituents, contribute to the variations in the quality of commercial tea.

Besides this, tea leaf contains carotene, riboflavin, nicotinic acid, pantothenic and ascorbic acid. Of these pantothenic and riboflavin content are appreciable. Ascorbic acid present in fresh leaves, is destroyed during the manufacture of black tea. The presence of Malic and Oxalic acids in tea has also been reported. Both fresh and green tea contain Kaemferol and quercettrin. Among the other constituents of tea, mention may be made of theophylline, theobromine, zanthrine hypoxanthine, adenine, gums, dextrins & inositol. The most important constituents of both green and black tea is the purine base alkaloid, caffeine. The caffeine distribution in the different part of the flush is as follows:

1st leaf & bud - 4.7; 2nd leaf - 4.5; 3rd leaf - 3.7; 4th leaf - 3.3; & stalk - 1.9% of the dried material. The amount of caffeine in the leaf does not change during tea manufacture. But the polyphenol (Tannin) undergoes change

during fermentation in black tea manufacture².

Tea is an accepted wholesome and stimulating beverage. It is said to be somewhat more stimulating to the muscular system than to the cerebrum and taken in moderation, it relieves body fatigue. It is stringent and diuretic. Excessive tea drinking is considered by some to have an injurious effect on digestion. Infusion of tea leaves are used in conjunctivitis because of their astringent characters².

Material & Methods:

Analysis of 120 samples of Kangra tea obtained during the span of four years was undertaken. Standard methodology was followed for the determination of following factors:

1. Total Ash; 2. Ash soluble in boiling water; 3. Acid insoluble ash; 4. Alkalinity of soluble ash; 5. Water soluble extract; 6. Crude fibre

Statistical analysis of physico-chemical constants have been reported in Tables I to VI.

Frequency Distribution Table:

Factor showing % share in total of different ranges of Kangra tea.

Table No. I

1. Factor : Total Ash Minimum : 4.84
No. of samples : 120 Maximum : 6.56

Range	No. of Samples	% share in total	Cumulative %
4.5 - 5.0	15	12.50	12.50
5.1 - 5.5	38	31.66	44.16
5.6 - 6.0	49	40.83	84.99
6.1 - 7.0	18	15.0	99.99
Total :	120	100.00	

Table No. II

1. Factor : Water soluble ash Minimum : 33.9
No. of samples : 120 Maximum : 56.0

Range	No. of Samples	% share in total	Cumulative %
33.0 - 35.0	1	0.80	99.94
35.1 - 40.0	5	4.16	99.14
40.1 - 45.0	8	6.66	94.98
45.1 - 50.1	32	26.66	88.32
50.1 - 55.0	56	46.66	61.66
55.1 - 60.0	18	15.0	15.00
Total :	120	100.00	

Table No. III

1. Factor : Acid Insoluble Ash Minimum : 0.04
No. of samples : 120 Maximum : 1.2

Range	No. of Samples	% share in total	Cumulative %
0.00 - 0.10	14	11.66	11.66
0.11 - 0.20	39	32.50	44.16
0.21 - 0.30	22	18.33	62.49
0.31 - 0.40	13	10.83	73.32
0.41 - 0.50	3	2.50	75.82
0.51 - 0.60	13	10.83	86.65
0.61 - 0.70	4	3.33	89.98
0.71 - 0.80	3	2.50	92.48
0.81 - 0.90	6	5.0	97.48
0.91 - 1.00	2	1.66	99.14
1.1 - 1.2	1	0.80	99.94
Total :	120	100.00	

Table No. IV

1. Factor : Water soluble extract Minimum : 25
No. of samples : 120 Maximum : 39.0

Range	No. of Samples	% share in total	Cumulative %
25.0 - 26.0	3	2.50	2.50
26.1 - 28.0	17	14.16	16.66
28.1 - 30.0	27	22.5	39.16
30.1 - 32.0	35	29.16	68.32
32.1 - 34.0	20	16.66	84.98
34.1 - 36.0	9	7.5	92.48
36.1 - 38.0	7	5.83	98.31
38.1 - 40.0	2	1.66	99.97
Total :	120	100.00	

Table No. V

1. Factor : Alkalinity of water Soluble ash Minimum : 1.0
No. of samples : 120 Maximum : 2.2

Range	No. of Samples	% share in total	Cumulative %
1.0 - 1.2	20	16.66	16.66
1.21 - 1.40	18	15.0	31.66
1.41 - 1.60	40	33.33	64.99
1.61 - 1.80	32	26.66	91.65
1.81 - 2.0	8	6.66	98.31
2.1 - 2.2	2	1.66	99.97
Total :	120	100.00	

Table No. VI

I. Factor : Crude fibre		Minimum : 10.8	
No. of samples : 120		Maximum : 18.68	
Range	No of Samples	% share in total	Cumulative %
10.0 - 11.0	1	0.80	0.80
11.1 - 12.0	1	0.80	1.60
12.1 - 13.0	2	1.66	3.32
13.1 - 14.0	9	7.50	10.82
14.1 - 15.0	27	22.50	33.32
15.1 - 16.0	55	45.83	79.15
16.1 - 17.0	23	19.16	98.31
17.1 - 18.0	1	0.80	99.11
18.1 - 19.0	1	0.80	99.91
Total :	120	100.00	

Table No. VII

Characteristic (On dry basis) Tea dried to constant wt. at 100°C	Requirement	
	Agmark	PFA
1. Total ash % by wt.	4.5 to 9.0	4.5 - 9.0
2. Total ash soluble in boiling distill water % by wt. (Min.)	34.0	34.0
3. Ash soluble in dil. HCl, % by wt. (Max.)	1.2	1.2
4. Alkalinity of soluble ash % (expressed as K ₂ O)	1.0 - 2.2	1.0 - 2.2
5. Water soluble extract by boiling dried tea for 1 hr under reflux % by wt. (Min.)	23	23
6. Crude fibre % by wt.	18.5	18.5

water soluble extract, alkalinity of water soluble ash and crude fibre, it has been observed that the results obtained for the samples collected during 4 years are well within the existing physico-chemical parameters prescribed for Kangra tea under Agmark & PFA (existing standard given at Table No. VII). It, thus reveals that there has been no significant change in the quality of Kangra tea being produced in our country. It has further been noticed that the existing standards are little liberal to take into account other aspects with regards to minor deterioration of quality due to natural calamities and causes.

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2. The Wealth of India (Raw Material) Vol. II. p 39 (1950)

Results and Discussions:

On perusal of the results obtained for total ash, water soluble ash, acid insoluble ash,

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Studies on Development and Storage Stability of Instant Carrot Halwa Mix

by

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Defence Food Research Laboratory, Mysore - 570 011

Abstract

Processing of instant carrot halwa and its storage stability in polypropylene (PP) and paper-aluminium foil-polyethylene (PFP) laminate packs at 0°C, room temperature (RT) and 37°C is reported. Instant carrot halwa remained stable for 12, 6 and 2 months in PFP and for 12, 12 and 4 months in PFP packs at 0°C, RT and 37°C respectively. Development of non-enzymic browning (NEB) was the major limiting factor to shelf life. Addition of sodium metabisulphite (300 ppm) in carrots before drying considerably reduced the rate of NEB but vacuum packing did not retard NEB development. Peroxide value (PV), free fatty acid (FFA) and thiobarbituric acid value (TBA) increased on storage but changes did not correlate with sensory quality.

Carrot halwa, Gajjar paak and Gajjar burfi are highly acceptable items of Indian confectionery more popular in northern and western parts. Due to seasonal availability of carrots and high perishability of the products, these are mostly marketed in winter months. Previously, a method to preserve carrot halwa for a period of about 3 months was reported¹. The method though quite innovative has not attracted the imagination of confectionery trade probably because of short shelf life. The present paper describes the results of study on the development and storage stability of instant carrot halwa mix.

Materials and Methods

Good quality carrots, milk powder, cardamom and sugar were obtained from the local market. The details of processing of instant carrot halwa have been reported earlier². Briefly the method consists of washing, peeling and grating of carrots, cooking under pressure, drying in a fluidised bed dryer, blending with other ingredients, conditioning and packing. For shelf life evaluation, 50 g samples were packed in polypropylene (75 µ) and paper (42 GSM) aluminium foil (20 µ) polyethylene (37.5 µ) laminate pouches, evacuated and sealed. For comparison packs were also sealed without evacuation. The packs were stored

at room temperature (15-34°C) and 37°C and analysed for peroxide value (PV), thiobarbituric acid value (TBA), free fatty acids (FFA) and non-enzymic browning (NEB). The sensory evaluation of the instant halwa mix was done after reconstitution as indicated below.

Reconstitution: To 50 ml of hot water 50g instant carrot halwa was added, contents mixed and heated for 5 min. Reconstituted samples were given to a panel of 10 judges for grading on a nine point hedonic scale (9 for excellent in all respects and 1 for highly disliked) for colour, flavour, consistency and overall acceptability.

Analysis: Proximate composition, PV, TBA, total carotenoids, NEB were determined as per months reported earlier^{3,4}.

Results and Discussion

Instant carrot halwa mix receiving highest sensory rating among various batches prepared by varying the proportion of carrot, sugar and milk solids had protein 9.1 ± 0.7 , fat $23.4 \pm 0.5\%$, total soluble sugar $44.5 \pm 2.1\%$ and total ash $2.5 \pm 0.1\%$. The dry mix had whitish colour but on reconstitution by mixing with equal quantity of water and simmering for 5 min, it acquired a typical reddish colour of freshly prepared carrot halwa. Among the various flavours

tried, cardamom flavour either as micro-encapsulated powder or freshly ground cardamom powder received the highest rating in flavour and overall acceptability. The freshly prepared instant carrot halwa received an overall acceptability score of 8.2 ± 0.5 on a nine point hedonic scale. Instant carrot halwa equilibrated to 1.9, 2.1, 2.6, 3.2, 5.2 and 9.7% moisture at 0.0, 0.12, 0.33, 0.43, 0.57 and 0.75 water activity (a_w) (Fig. 1). Because of very narrow moisture range (2.0-2.6) in the stable a_w zone, moisture control during processing and storage is very critical for adequate storage stability. On storage, instant carrot halwa mix tended to acquire yellowish colour which on reconstitution turned into unattractive brown colour mainly due to NEB reactions with concomitant formation of caramelised odours and decrease in overall acceptability score. Soaking of grated carrots in sodium metabisulphite solution considerably reduced the susceptibility of instant carrot halwa mix to NEB reaction on storage.

Even in metabisulphite treated instant carrot halwa mix, colour deterioration played the major role in determining overall acceptability. Rancid and violet off odours generally associated with the storage of milk powder and dehydrated carrots were not observed during storage of instant car-

Table - 1 : Changes in free fatty acid (FFA) (% oleic acid), peroxide value (PV, meq O₂/kg fat) and thiobarbituric acid (TBA, mg malonaldehyde/kg sample) during storage of instant carrot halwa mix in PFP and PP at 0, RT and 37°C

Storage Period (months)	Packaging material	FFA			PV			TBA		
		0°C	RT	37°C	0°C	RT	37°C	0°C	RT	37°C
2	PFP	0.24	0.29	0.30	0.65	0.99	1.38	0.09	0.09	0.10
	PP	0.24	0.26	0.24	0.96	1.00	1.56	0.10	0.11	0.11
4	PFP	0.25	0.34	0.32	2.04	1.70	1.96	0.12	0.08	0.09
	PP	0.28	0.33	0.34	1.96	1.24	2.47	0.10	0.10	0.10
6	PFP	0.27	0.32	0.32	2.26	2.32	2.00	0.10	0.09	0.10
	PP	0.26	0.30	0.36	2.60	1.86	2.50	0.12	0.10	0.12
8	PFP	0.20	0.25	0.36	3.40	3.80	2.18	0.11	0.10	0.10
	PP	0.26	0.29	0.40	3.30	2.00	2.63	0.12	0.12	0.12
10	PFP	0.20	0.24	0.43	5.27	4.50	2.35	0.13	0.09	0.10
	PP	0.14	0.27	0.41	5.21	2.44	2.72	0.13	0.10	0.13
12	PFP	0.15	0.19	0.41	3.95	2.62	3.28	0.17	0.20	0.10
	PP	0.10	0.27	0.42	3.27	1.09	3.26	0.19	0.15	0.21

The initial values for FFA, PV and TBA were 0.23, 0.53 and 0.04 respectively.

rot halwa mix. Changes in NEB, total carotenoids and overall acceptability scores when stored in PP and PFP packs at O, RT and 37°C are given in Tables 1 and 2. In the present study, decrease of overall acceptability score to 6.5 was taken as the end of useful shelf life. Based on this criteria instant carrot halwa mix remained acceptable for the entire storage period of 12 months at O°C in PP and PFP packs. At RT also, it remained acceptable for 12 months in PFP packing and for 4 months at 37°C. But in PP packs, it remained acceptable only for 6 months at RT and for 2 months at 37°C (Table 2). Increases in NEB also followed the same pattern, while at 37°C NEB increased by 5 to 7 fold in 4 months, there was only a 3 to 4 fold increase at RT and 2 fold increase at O°C after 12 months storage. Also, comparatively the increase were more in samples stored in PP packs than in PFP packs (Table 2). Packing instant halwa mix under vacuum did not significantly influence the rate of NEB.

Both packaging and storage temperature influenced the changes in total carotenoids in instant carrot halwa. After 12 months storage, the retention in total carotenoids were 89.1, 83.1 and 47.6% in PFP packs and 76.5, 63.3 and 28.3% in PP packs at O°C, RT and 37°C respectively (Table 2).

Instant carrot halwa mix processed from without sodium metabisulphite treatment of carrots, the losses in total carotenoids were considerably higher. Carotenoid retention was slightly higher in vacuum packed samples.

Though hydraulic and autoxidative degradations of fats are major problems in the storage of dehydrated convenience foods, surprisingly changes in FFA, PV and TBA did not correlate with the changes in overall acceptability scores of instant carrot halwa mix. FFA in instant carrot halwa ranged from 0.23 to 43 while PV varied from 0.53 to 4.2 during 12 months storage at various temperatures (Table 1). Surprisingly, increases in PV were least in samples stored at 37°C but increases in FFA were largest at 37°C. TBA value of instant carrot halwa mix varied from 0.04 to 0.22 mg MA at various temperatures, increase in TBA did not seem to relate to the changes in sensory scores of stored samples (Table 1). Though vacuum packing of dehydrated milk products generally minimises changes in PV and TBA, in instant carrot halwa mix changes in FFA, PV and TBA were not influenced by vacuum packing either in PP or PFP packs. This may have occurred due to the susceptibility of malonaldehyde to react with milk proteins. Previously also,

Table - 2 : Changes in total carotenoids (ug/g), browning (O.D.) and overall acceptability of instant carrot halwa mix in PEP and PP when stored at O°C, RT and 37°C

Storage period (months)	Packaging material	Total Carotenoids			Browning			Overall acceptability		
		OOO	RT	37OC	OOO	RT	37OC	OOO	RT	37OC
2	PFP	158	152	147	0.04	0.05	0.06	7.3	7.2	6.8
	PP	148	146	134	0.04	0.05	0.08	7.1	7.0	6.5
4	PEP	154	148	122	0.08	0.10	0.21	7.4	7.0	5.7
	PP	145	138	108	0.07	0.10	0.28	7.5	6.6	5.1
6	PEP	155	145	105	0.08	0.11	0.24	7.5	7.0	4.5
	PP	144	132	94	0.08	0.13	0.32	7.2	6.5	3.2
8	PEP	149	143	92	0.06	0.12	0.33	7.4	6.8	1.0
	PP	135	128	88	0.07	0.15	0.38	7.3	5.2	1.0
10	PEP	150	141	87	0.06	0.13	0.38	7.8	6.5	1.0
	PP	132	117	68	0.06	0.16	0.41	7.2	3.4	1.0
12	PEP	148	138	79	0.07	0.13	0.40	8.0	6.8	1.0
	PP	127	105	47	0.08	0.18	0.42	7.7	4.5	1.0

The initial values for total carotenoids, browning and overall acceptability were 166, 0.04 and 8.2 respectively.

TBA value in proteinous products has been reported to decrease after reaching a peak value due to reaction of malonaldehyde with amino acids and proteins⁶.

From the foregoing discussion, it is evident that instant carrot halwa remained stable for 12 and 4 months in PFP packs and for 6 and 2 months in PP packs at RT and 37°C respectively. Major spoilage in instant carrot halwa during storage is caused by the NEB reactions resulting in development of unattractive brown colour on reconstitution of the stored samples. Incorporation of sodium metabisulphite in carrots reduced the rate of NEB and carotenoid degradation of instant carrot halwa, but vacuum packaging did not seem to substantially help in extending the shelf life.

Acknowledgement

Authors are thankful to the Director, Defence Food Research Laboratory, Mysore, for providing necessary facilities.

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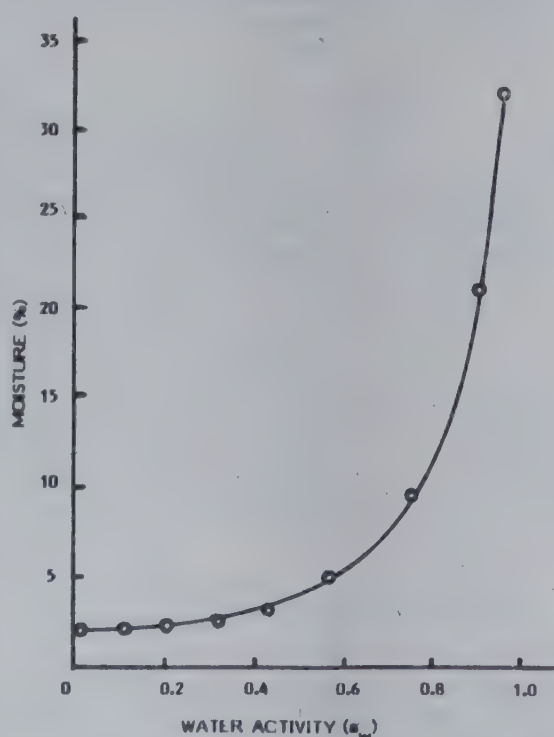


Fig. 1. Moisture sorption isotherm of instant carrot halwa

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Quality Aspects of Water Supply

by

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A good quality potable water supply is essential to food processing plant. Water is required in a food plant for transfer of heat, steam generation, cleaning and processing of food products. Water supplied to food plants should be of high quality with respect to chemical and microbiological point of view.

Problems arise because of dissolved substances from source to ultimate use during its travel. The dissolved impurities are mainly minerals, presence of organic matter and bacterial contaminant.

Surface water originates from streams, lakes, reservoir. Such water may be contaminated with seaweed, mud, decayed vegetation, human and animal refuse and industrial waste. Water polluted with sewage or decayed animal matter may carry pathogens. Decayed vegetable matter permits algae to grow which impart unpleasant taste and odor to water. Industrial waste results in contamination with toxic compounds - phenols, cyanides, chromium compounds. Phenol reacts with chlorine to form chlorophenols which impart medicinal flavour to water.

Ground water originating from wells and springs, may have greater clarity, lower bacterial count, uniform minerals content and constant temperature. However in few cases, higher amounts of calcium and magnesium, lower amounts of iron, manganese and hydrogen sulphide are present.

Food processing plants are concerned with three broad sanitary aspect of water supply (microbiological, purity and safety and chemical impurities) which affect suitability in processing and its contamination load after use. Contamination load has always been of utmost importance since it affects the difficulty and cost of disposing of waste water. It has taken an increasing importance in recent years since anti-pollution laws prohibit many of the former practices of waste water disposal. Further, the contamination loads of larger food plant waste water frequently exceed the purification capacity of municipal sewage plants. In such case, food plants are now required to adopt their own waste treatment systems if they are to be permitted to operate under growing complexity of regulations by federal, inter-state, state and municipal agen-

cies.

Potable water should meet the following standards:

1. Free from bacteria which may cause disease.
2. Colourless and sparkling
3. Tasty, odor free and cool
4. Should not corrode pipes
5. Free from objectionable matter
6. Should have dissolved oxygen and free carbonic acid.

For the safety of public health, economy and protection of various food processing industries, it is most essential to treat raw water before its utilization. Therefore water entering a food processing plant should meet health standards for potable water. On December 24th, 1975, the Environmental Protection Agency issued national interim primary drinking water regulations. Regulations covering radio active contaminants were added on July 9th, 1976. These primary regulations are concerned with health. Secondary regulations deal with color, taste and other aesthetic qualities of water (Environmental Protection Agency, March 31, 1977). In addition to the chemical limits for safety of potable

Primary Drinking Water Regulations

Characteristics	Limit not be exceeded (ppm)
Inorganic chemical	
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10.0
Selenium	0.01
Silver	0.05
Fluoride	1.4 to 2.4
Organic Chemicals	
Endrin	0.002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
2,4-D	0.1
2,4-5-TP Silvex	0.01
Turbidity	1 Unit (Statistical value)
Coliform	1/100 ml (Statistical value)

Impurities in Water

All the impurities of water are listed broadly as follows:

Impurities	Effects of impurity
Suspended	
— Bacteria	— Most of them cause disease
— Algae, Protozoa	— odor, turbidity and colour
— Clay, Silt	— Turbidity

Dissolved

Calcium and Magnesium	
— Bicarbonates	— Hardness and Alkanity
— Carbonate	— -- do --
— Sulphate	— Hardness
— Chloride	— Hardness

Sodium

— Bicarbonate	— Alkalinity and softening
— Carbonate	— -- do --
— Fluorides	— Mottled enamel of teeth
— Chloride	— Taste

Metals

— Manganese	— Black or brown colour
— Iron oxide	— Taste, corrosiveness, hardness & red water
— Lead	— Lead poisoning
— Arsenic	— Poisoning

Gases

— Oxygen	— Corrode metal
— Carbondioxide	— acidity and corrode the metal
— Hydrogen sulphite	— rotten egg odour, acidity, corrode the metals

Organic Impurities

Suspended

— Vegetable, fruits and their waste	increase microbial load
— Animal and its refuse (dried)	Pollution of water, produce disease germ

water, this must also be free from contamination with sewage and pathogenic organisms.

Characteristics of potable water

From health point of view, potable water must meet certain standards prescribed by US Public Health service which are as follows:

Physical characteristics: Potable water to be used for human consumption must adhere to the following tests.

A. Temperature

The temperature of water controls the microbial activity and chemical reactions

upto some extent. The temperature of surface water is generally at atmospheric temperature while that of ground water may be more or less than atmospheric temperature. The most desirable temperature for supplying to food plants or public supply is between 4.4 to 10°C. The temperature above 28°C are undesirable and above 35°C is unfit for supplying, because it is not palatable.

B. Colour

The colour of water is usually due to organic matter present in colloidal form, but some times it is also due to mineral and dissolved organic impurities. To estimate the value of colour, water sample should be centrifused in order to remove suspended solids, then colour may be estimated by visual comparison of the sample with standard sample (using platinum-cobalt comparator) or by tintometric measurements. The permissible colour for domestic water supply is 20 ppm on platinum -cobalt scale. In general for water to be used in food plants should have 5 to 10 ppm colour.

C. Turbidity

Turbidity is an indication of the clarity of water and should be performed by measuring suspended and colloidal matter in the water. Ground water turbidity is estimated in terms of Formazin turbidity units. Nephelometry is now the preferred technique, in which the intensity of scattered light is measured normally at right angle to the incident light. Turbidity can also be measured by turbidity rod or tube, Jackson's or Baylis turbidimeter. Jackson turbidity units, nephelometric turbidity units (NTU) and formazin turbidity units (FTU) are all equivalent. Water turbidity for food plants should range from 1-10 ppm. It is recommended that potable water should have minimum possible turbidity.

D. Taste and Odour: The taste and odour of water are closely linked and rely upon subjective assessments. The intensity of taste and odour is determined as a threshold number, normally by a sensory panels. The threshold number relates to the degree of dilution of the sample before no positive assessment is obtained. Samples are generally dechlorinated before the test takes place and the method measures any natural odour and excludes any contribution made by addition of chlorine to the water supply.

Chemical analysis

Alkalinity: Bicarbonate, carbonate and hydroxide ions are responsible for the alkalinity of water. The alkalinity of water is

determined by titration with a strong acid, and the various relationships which may be present are distinguished by the use of appropriate pH indicators.

pH :

pH is an indicator of the acidity or alkalinity of water and is ranged between 6.0 and 9.0. Corrosion and scale formation are controlled by the pH of water supply and its measurements are made by pH meters calibrated with the help of standard buffer solutions.

Hardness :

The hardness of water is due to the salts of calcium and magnesium bicarbonates and responsible for temporary hardness, whereas permanent hardness is caused due to presence of calcium and magnesium chlorides, sulphates and nitrates.

The presence of organic compounds in water can be detected quantitatively at concentrations as low as 10 ng l⁻¹. Advanced techniques such as mass spectrometry, head space analysis and liquid chromatography, are being used to detect organic contaminants at very low concentrations.

The hardness of water may be expressed quantitatively in terms of ppm of calcium, ppm of calcium carbonate, grains per gallon of calcium carbonate or equivalent value for magnesium.

Classification of water hardness

Degree of Hardness	Total calcium + magnesium ions expressed as CaCO ₃	
	(ppm)	(grain/gal)
Soft	<50	<2.9
Moderately hard	50-100	2.9 to 5.9
Hard	100-200	5.9 to 11.8
Very hard	>200	>11.8

Trihalomethanes (Haloforms); Organo-chlorine pesticides (DDT, dieldrin and Lindane); Phenoxy Acid Herbicides (Dalapon, MCPB and 2,4-D); Triazine and Uron Herbicides (Diuron, Linuron, Atrazine and Simazine); Polycyclic Aromatic Hydrocarbons (PAHs) and Phenols.

Microbiological standards for water supplies

Potable water must adhere to the microbiological standards in order to supply quality water for human consumption, decide types of treatments and its evaluation. Total plate count is carried out for measuring

the general bacterial purity of the water. Fecal organisms such as *E. coli*, *Streptococcus faecalis* and *Clostridium spp.* can be taken as an index of pollution. Generally, coliform counts are carried out to known the presence faecal contamination.

Viable counts:

Counts are made from dilutions of the water on a standard medium after incubation at 22° and 37°C. Most saprophytic bacteria grown on the standards medium at this temperature, will be included in this count. Since the number of saprophytes present is likely to be proportional to the amount of organic matter available for their nutrition, this count gives a rough idea about the relative amount of organic matter present in the water. The majority of organisms grown at 37°C will be parasites or potential parasites of man and animals, derived from soil, excreta or sewage. A high count at 37°C relative to the count at 22°C, almost always indicates pollution with animal or human excreta. In unpolluted water the ratio of the count at 22°C to that at 37°C is usually greater than 10:1, in polluted water the ratio is much lower and may be 1:1.

The water is further examined for the presence of specific bacteria of known intestinal origin. *E. coli* (*Bacterium coli faecal type I*) present in human and animal excreta, is used as the indication strain in official tests. Many coliform bacteria are found on vegetation and in soil but *E. coli* is found transiently outside the alimentary canal and its presence in water is thus almost certain evidence of recent faecal contamination.

The demonstration of even a few *E. coli* in water is sufficient to condemn it as unfit for human consumption even though no pathogens have been found. Two tests are used to detect *E. coli*: the presumptive coliform count and the identification of isolated strain by differential biochemical tests. The standards required vary for different types of water but in general, in unchlorinated water with more than 5 coliform bacilli per 100 ml would be regarded as unfit for drinking. Chlorinated water would obviously be expected to have no viable coliform presence. The plate counts are also particularly useful in determining the efficiency of water treatment process such as filtration, coagulation, separation and chlorination.

Biological standard for water supply

Total colony count	30/ml
<i>B. coli</i>	Nil in 100 ml
M P N	One in 100 ml

Conventional water treatment

Due to high degree of pollution problems, water treatment is a very essential step to make potable water safe in the public health point of view. Water treatment makes water free from harmful bacteria and virus, to reduce toxic substances upto standard levels and protection of the water through distribution systems. Conventional physical and chemical treatments remove dissolved and suspended organic and inorganic matter which could increase the efficiency of disinfectant to minimise the problems of microbial growth and chemical quality must be achieved to prevent erosion. The following steps are involved in the water treatment process: **Sand filtration:** Sand filtration is the oldest technique controlling water borne disease and used to remove solids and inactivates virus non pathogenic and pathogenic bacteria.

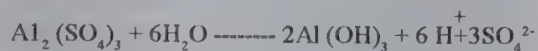
The filter basin is constructed of stone, brick or concrete with a large surface area. Fine sand at a depth of 0.6 - 0.8 m is supported on a 0.1 - 0.3 m layer of gravel overlying the system of under drains for collecting the treated water. A reservoir of raw water is maintained at a depth of around 1 m above the filter bed in order to provide pressure for the water to pass through the filter. The rate of water flow is controlled by simple outlet valves.

The treatment mechanisms being biological in nature also consist of physical and chemical process. The suspended matter settles within hours or days and a layer consisting largely of organic matter known as schmutzdecke, develops over the surface of the sand. This layer supports the growth of algae, protozoa and bacteria which entrap and digest organic matter from the

water. An adsorption and microbial mechanism result in purification as the water passes through the filter bed. The total number of bacteria can be reduced by factors between 1000 and 10000. Due to demerits such as large areas needed, low throughput, labour intensive filter cleaning and high maintenance costs make slow sand filtration process less preferable than chemical treatments in industrialized countries. Renewed interest has been generated in slow sand filtration as an appropriate process for reducing dissolved organic carbon and inactivation of pathogenic microorganisms. Slow sand filtration is not suitable for raw waters with turbidities in excess of 20-50 nephelometric turbidity units (NTU).

Coagulation and Flocculation

Coagulation is usually accomplished by the addition of Alum (Aluminium sulphate) or ferrous sulphate to the water, which provide highly charged, hydrolysed ions in water.



Flocculation is the agglomeration of the particles although coagulation describes both the processes.

The optimum conditions for coagulation and flocculation may vary depending upon source, pH and temperature of water. Typically, coagulation is carried out with doses of 2-5 mg of iron and aluminium per litre and within pH 6.5 - 7.5. Aluminium sulphate is most widely used coagulant and it is particularly effective for treating highly coloured water.

It is important that the coagulation chem-

icals are dispersed rapidly through the water to ensure good contact with the colloids. This is often achieved by vigorous or 'flash mixing' for about 1 min in an initial tank, followed by more gentle mixing for 20-30 min to facilitate flocculation. Adjustment of raw water pH for optimizing coagulation is carried out by addition of sulphuric acid, lime or sodium hydroxide.

Separation

After coagulation, floc is separated from the clarified water. This is obtained by sedimentation or dissolved air flotation followed by filtration to produce the treated water with waste sludge and filter back wash water.

Sedimentation is the removal of particulate matter and chemical floc through gravity settlement. Most plants are upflow clarifiers, in which the water enters at the bottom of the tank and rises vertically at a slow velocity in the order of 1-3 meter per hour which maximizes the settlement of the flocculated particles. Sludge accumulates at the bottom may be removed. Upflow clarifiers may combine the processes of mixing, flocculation and sedimentation in a single compartmentalized tank. This is typically a circular tank with a central inlet, for raw water and chemicals, and an inverted-cone-shaped flocculation area surrounded by an outer, annular clear water section.

Dissolved-air flotation separation process is applicable to treatment of algae-rich waters where flocs formed have tendency to float rather than settle. It separates solids from liquids. It works on the principle that fine air bubbles created in the medium attach themselves to solid particles and rise to the surface. In this way solids with



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densities less than water can be removed.

Air bubbles can be created by (i) air diffusion (ii) saturating the liquid medium with air then subjecting the mixture to a vacuum to create bubbles and (iii) by saturating air with liquid under high pressure then releasing the pressure to form air bubbles. Upon pressure release in the flotation tank, the dissolved air forms fine air bubbles which agglomerate with the floc particles and cause them to rise to the surface, where the floating sludge accumulates. This sludge may be removed continuously at constant intervals by mechanical device.

After separation, the clarified water contains some residual floc which is usually removed by gravity or pressure sand filtration. Adjustment of pH to minimize corrosive properties is essential within the distribution system.

Removal of Iron and Manganese

Underground water may contain soluble forms of iron and manganese. These reduced forms slowly oxidize to insoluble oxides on exposure to oxygen, which are brown in colour and quality wise unacceptable. Spraying or splashing of water into atmosphere may oxidize iron from the solution which is removed by filtration and potassium permanganate is used to oxidize

manganese present in water.

Control of taste and odour

Treatment of water by carbon absorption process may minimise the taste and odour problem. Activated carbon produced by combusting coal, wood, coconut shells or maize cobs to produce a very porous material have more absorptive capacity. The carbon is supplied in powdered or granular form and latter form is increasingly used as a filter medium for final treatment prior to chlorination. The granular form of carbon filter bed is used with 5 to 7 min contact time for taste and odour removal and its absorptive capacity is exhausted after 2-3 years. Its activity is regenerated by heating at higher temperature.

Chlorination

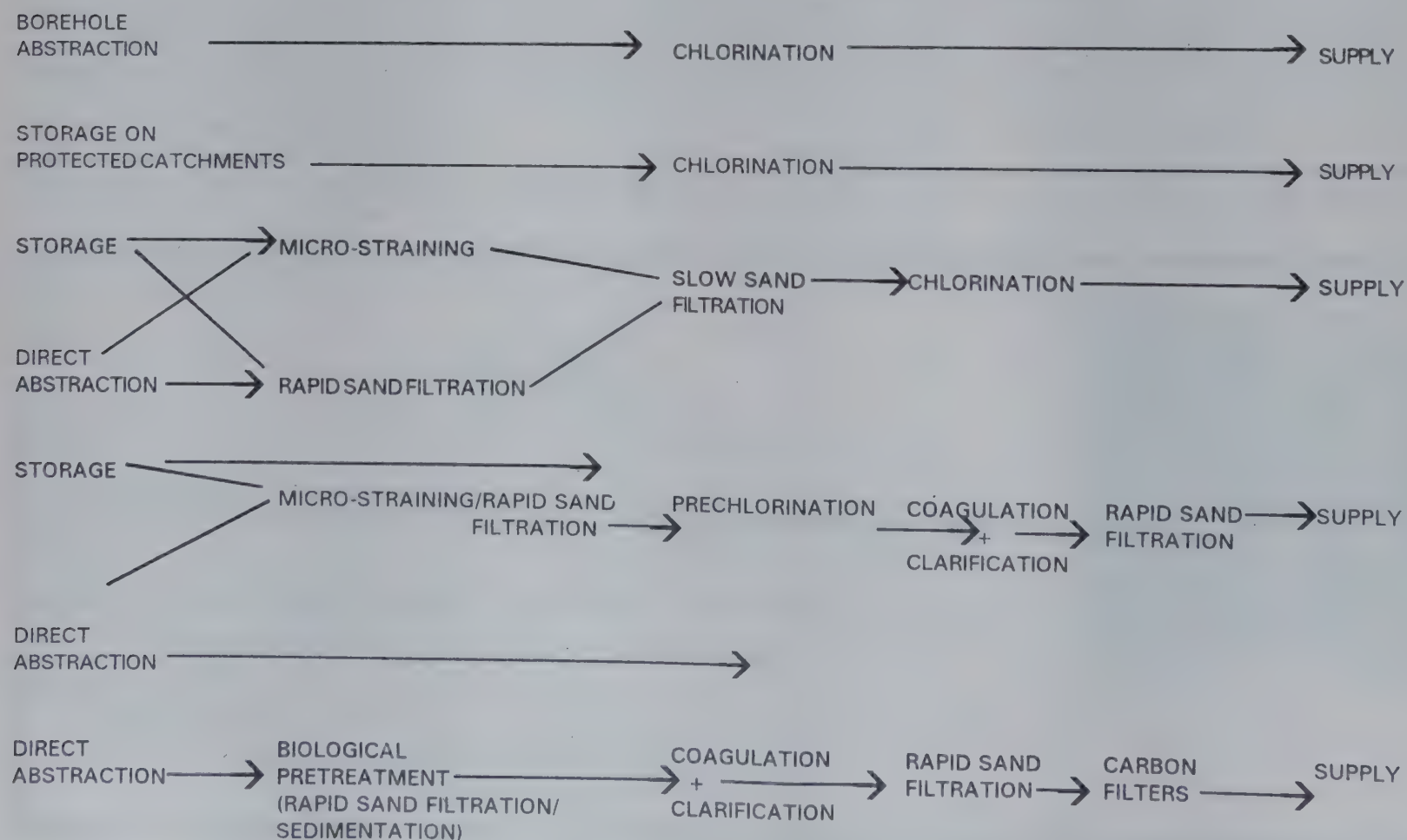
Chlorination is most widely used to render water supplies safe from health point of view. The food processor often further chlorinates water in the plant to use as a disinfectant in processing. Whether water is rendered bacteriological pure at the municipal treatment plant or subsequently made to have disinfectant properties for special use, effective chlorination must take into account, the different chlorine demands of various water before a germicidal effect can be obtained.

A variety of substances including organic matter, ammonia, nitrites and ferrous iron present in water may react with chlorine and inactivate it before the chlorine can exert its germicidal effect. Hydrogen sulfide and organic impurities are particularly objectionable in this regard. Only after these interfering substances are satisfied in terms of their chlorine demands then residual free chlorine have a significant killing or inhibitory effect upon micro-organisms. This gives rise to the concept of break point chlorination.

Simple chlorination methods are adequate for good water quality but superchlorination is required for surface water supplies. A high dose of chlorine (5 ppm) with 30-60 min contact time is required. Dechlorination with sulphur dioxide is necessary to reduce the chlorine residual to 0.2 - 0.5 ppm in drinking water. The residual chlorine is essential to check the further growth of microorganisms within the distribution systems.

A suspected carcinogenic compounds - trihalomethanes (THMS) such as chloroforms are produced during chlorination of surface water having organic compounds of human origin. Removal of the precursor compounds during processing prior to chlorination aims to control the production of THMS.

COMBINATIONS OF WATER TREATMENT PROCESSES



"Bifidus Factor" - Chemistry and Human Nutrition

by

Debashis Sarkar * and D. Datta Roy**

Prelude

Human milk has been established to be the most appropriate form of milk for an infant. Like in most animals, this milk meets the need for maintenance and growth of human infants. The various biochemical constituents in turn aid in the ideal growth of infants.

Lactose content is more in human milk (6.8%) than in cow milk (4.9%). The high lactose content renders the following advantages:

1. It has a less tendency to give a feeling of fullness;
2. It provides a beneficial medium for the intestinal function by promoting growth of *Lactobacillus bifidus* flora for lactic acid production and adequate hydrogen iron concentration of the gut;
3. It helps in the proper absorption of calcium for bone formation;
4. Galactose, one of the split products of lactose, is an essential component for the formation of cerebrosides of myelin of nervous system and glycoproteins of collagens, which supports the rapid growth of brain.

It is a well established fact now that *Bifidobacterium bifidum* is the major microbe present in the breast-fed infants. This is due to biological compounds collectively termed as "Bifidus Factor". This factor is present in human milk at levels of 40-50 times more than milk from other mammals. Recent research has brought out a crystal clear picture on the role of "bifidus-factor" in infant nutrition.

Chemistry of Bifidus Factor

As already mentioned, "Bifidus Factor" are chemical compound or compounds that accelerate the growth of *Bifidobacterium bifidum*. For example - Sugar and sugar derivatives, nitrogen containing oligo-saccharides, glycoproteins, protein hydrolysates and certain fatty acids.

Kokubu (1961) observed that certain sugars as lactose when supplemented with α -Keto-glutaric acid, succinic acid, oxaloacetic acid, pyruvic acid, aspartic acid or thiamine pyrophosphate had stimulatory factors for *B. bifidus*. Lambert and Zilliken

(1965) reported that "Bifidus factor" consisted of N-acetyl-D-glucosamine and its derivatives particularly β -ethyl-N-acetyl-D-glucosamine and N-carboethoxy-D-glucosamine. From the studies carried out by Jao et al. (1978), it was found that stimulatory effect is in the order of N-acetyl glucosamine > N-acetyl galactosamine > N-acetyl mammosamine > N-acetyl neuraminic acid. These workers have also investigated the growth requirements of *B. bifidum*. They showed that *B. bifidum* and *B. bifidum var penn* have an absolute requirement for pentithene. Some strains of *B. bifidum var penn* require specific bifidum factor. In human milk this has been recognized as N-acetyl glucosamine and N-acetyl lactosamine. These strains also require additional supplementary factors that are present in human and bovine milk, in insulin and pancreatic extracts, as well as enzymic hydrolysates of bovine casein and casein free whey. In 1961 Adacchi reported that lactulose also acted as growth promoting substances for *B. bifidum*.

Chemical Compounds Manifesting Bifidus Growth Promoting Activity:

It was reported by Gyorgy et al. in 1954 that human milk has an essential growth factor for a variant of *Lactobacillus bifidus*. This variant is *L. bifidus var pennsylvanicus*. The bifidus growth factor in human milk is destroyed/alterd by autoclaving.

When the activity of *L. bifidus var pennsylvanicus* was compared with other species it was found that average relative activity was highest for human colostrum closely followed by rat colostrum, then by human milk, rat milk and cow's colostrum. Paradoxically, the milk of ruminants showed only very slight activity. The bifidus growth factor has been demonstrated in high concentration in various secretions in man as saliva, semen, tears etc. (Gyorgy et al. 1954b).

The lactose free active concentrates of human milk give acetic acid and four sugars i.e. D-glucosamine, L-fucose, D-glucose and D-galactose. By chromatography on charcoal and a paper at least four different active components have been found. All of them contained N-acetyl glucosamine units (Gyorgy et al 1954b).

N-acetyl glucosamine derivative of D-

glucosamine also promotes growth. The growth promoting activity increases with chain length of the aliphatic N-acetyl residues (Lambert and Zilliken, 1965).

In the process of isolating sialic acid from bovine isoalactric casein a hydrolytic produce was obtained, possessing growth promoting activity of *B. bifidum var pennsylvanicus*. This fraction contained 15% phosphorus, 7% free lactose and various peptides. It is likely to be a degradation product of K-casein. Its stimulation activity is comparable to one obtained by N-acetyl glucosamine (Tomarelli et al. 1969).

Unsaturated fatty acids as linolic, oleic and vaccenic, and related compounds also exhibited growth stimulation. *B. bifidum* activity increased noticeably after pancreatic digestion of whole milk, human milk and cow's milk showing equal activity after pancreatic digestion. However, high concentration of digested cow's milk but not of human milk was found to exhibit bacterial growth (Kahagias, et al 1977).

When a breast milk substitute resembling breast milk in several ways was devised and fed to new born infants the faeces developed the characteristic of those of breast fed child (Willis et al. 1973).

It has also been reported that *Bifidum* significantly inhibited the growth of *E. coli* as well as *B. subtilis* (Dolezalac, 1980). It has also been observed by Anoelo et al. (1980) that *L. bifidum* inhibited the growth of *Candida albicans*. Mayer observed in 1965 that disappearance of *B. bifidum* from the intestines of infants make them more susceptible to viral and enteric infections.

Role of B. bifidum in Nutrition

B. bifidum is considered important in relation to general well being and maintaining normalcy of various physiological function among infants. Several factors are mainly attributable to feed which in its turn influences the production and maintenance of *B. bifidum* flora. Their survival in the gastro-intestinal tract seen to result from the ability of certain strains to stand at low pH and high bile salts concentrations (Lipinsk, 1978). However, when *E. coli* dominates the intestinal microflora, as in case of cow's milk, the pH of stools tend to vary between 6.8 to 7.0 (Willis et al. 1973)

The following are some of the roles

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played by *B.bifidum*:

a) **Synthesis of B complex vitamins:**

Presence of *B.bifidum* in the intestinal tract of infants leads to the biosynthesis of certain B complex vitamins which is congenial to the growth of infants (Peter, 1960).

b) **Absorption of minerals:**

Acidic environment in the intestine is considered most favourable for calcium and other minerals (e.g. iron and phosphorus) absorption (Keels and Nail, 1966). These workers reported that the absorption of iron and calcium was 83.2% and 91.2% respectively in case of rats fed with bifidus containing dried products.

c) **Resistance to infection**: It is known that *B.bifidus* produces certain antibiotics which inhibit the growth of enteropathogenic bacteria e.g. *Shigella* and *E.coli*. Peter reported in 1960 that *B.bifidum* has anti-microbial properties against pathogenic *E.coli*, *Shigella* and *Salmonella*. *B.bifidum* produces antibiotics which are strongly inhibitory to *Shigella* and *Salmonella* but only display nominal antibiotic activity against *E.coli*.

d) **Detoxification role in chronic liver disease:**

Mutting *et al.* (1968) and Mayer (1969) suggested that the development of *B.bifidum* flora in the gut causes detoxification in chronic liver disease.

"Bifobacterium bifidum" and other Intestinal Flora of Infants

By the end of first post-partum week the *Lactobacillus bifidus* flora represents 95% of all culturable microorganisms (*Bacterioids*, *Streptococci*, *Clostridium*, *Micrococci*, *Entecocci* and *E.coli*), in the fecal smears of breast fed infants. When breast feeding is stopped the non-bifidus flora progressively in number. The aerobic and non-aerobic lactobacilli are found in the greater amounts in breast-fed infants than in bottle fed infants. Due to higher lactose and lower protein content breast milk exhibits decrease buffer capacity. Bifidus bacteria metabolises saccharides thereby producing acetic acid, lactic acid and trace amounts of formic and succinic acid. All these acids are responsible for low pH (pH 5.3) of faeces of breast fed infants in contrast to stools of infants fed with cow milk formula wherein neutral or alkaline pH is observed. It appears that this bifidus factor flora provides resistance mechanism against, intestinal infections from *Staphylococcus aureus*, *Shigella* and protozoa. Sialic acid from human milk may inhibit influenza virus activity.

Bifidus factor, complement and lysozyme together with high concentration

of lactose are responsible for the proliferation of bifido bacteria in the terminal ileum and large intestine of infants exclusively fed with breast milk. Due to accumulation of bacterial metabolites amongst them notably the short chain fatty acids, the intestinal milieu is antagonistic to invasive enteric bacteria and protozoa. The strong and striking resistance of breast fed infants to colonization of coliforms, enteropathogenic *E.coli*, *Shigella* and protozoa even in environments in which the risk of infection is high has been exclusively demonstrated in a rural setting (Mata, 1978).

Lactoferrin, an iron binding protein like transferrin bound in the breast prevent the growth of gram negative organisms. As the lactoferrin level declines, bifido bacteria colonize in the large intestines which in turn produce a buffered acidic environment, unsuitable for the growth of *Bacterioides fragilis*.

Until birth the gastro intestinal tract is sterile but within hours the buccal mucosa is colonized by gram positive bacteria mainly cocci and bifido bacteria. The type of delivery and the food also play a role in the establishment of intestinal flora in infants (Tadopalli, 1981).

Though there is controversy about the influence of diet in the intestinal flora in humans, there is data indicating that the fecal flora of breast fed infants differs from that of infants fed with cows milk-based formulas at least in quantity. Coliform and fecal streptococci are the first bacteria to appear in faeces and that their number rapidly increase during the first few days of life. These organisms then decline to approximately 10^6 to 10^7 bacteria per gram during second week of life in breast fed infants while remaining at higher level in infants fed with cows milk-based formulas (Hentges, 1980).

Bifido bacteria usually appear in the gut shortly after coliform and achieve stable level of 10^9 to 10^{11} organisms per gramme by the middle end of life. Large number of *Clostridia* are present during the first few days of life and then rapidly decline to low or undetectable number by the end of first or second week in breast-fed infants fed while remaining at very much higher level in infants fed with cows milk-based formulas. This is very important because members of *Clostridia* genus may have pathogenic properties on the gut. Interestingly breast fed infants seem to be more resistant than formula fed infants to certain types of infections such as respiratory and enteric infections (Hentges, 1980, Welsh and May 1979).

Antimicrobial factors are not destroyed

in donated human milk if collected cleanly; refrigerated rapidly and utilized quickly without heat treatment. Heating to 62.5°C for 30 min. effectively decontaminates without destroying the antimicrobial property (Welsh and May, 1979).

Conclusion

In this article an attempt has been made to portray the role of "bifidus factor" in human nutrition. Different biological compounds in mothers' milk stimulate the growth of *B.bifidum* and *B.bifidum var pennsylvanicus* in the intestine of human infants. Such growth of bifidus organism in the intestine of new born infants produces an unfavourable condition for the growth and survival of enteropathogenic and viral organisms to the intestine of human babies. Also growth of *B.bifidum* and *B.bifidum var pennsylvanicus* helps in absorption of minerals by infants and also promotes the biosynthesis of vitamin B-Complex in the infantile intestine.

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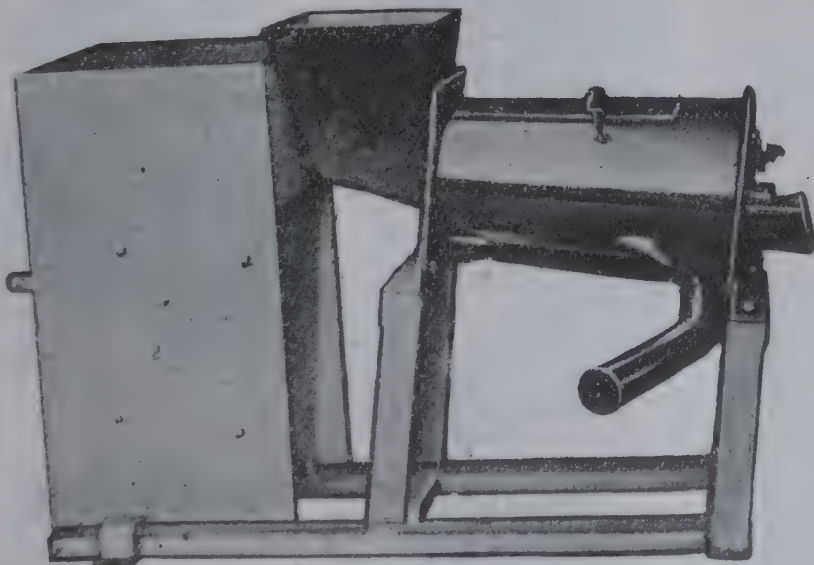
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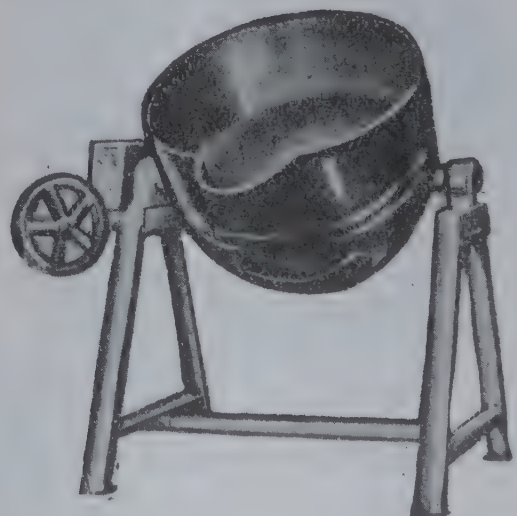
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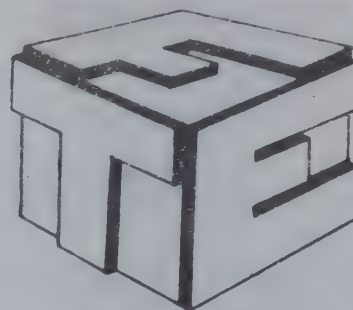
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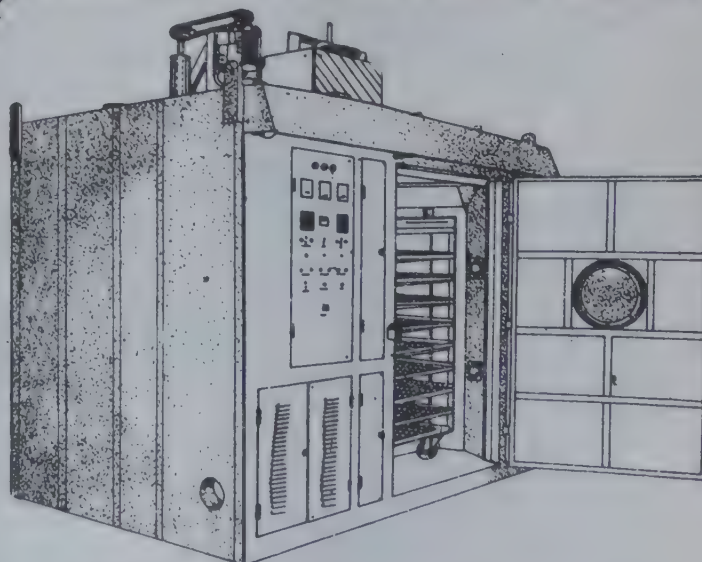
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NEWS & NOTES

INDIAN PALATES ALL SET FOR FRENCH FRY BATTLE

Complementary to the fast food explosion. Americans perceive that India will now be caught in the midst of a French fry revolution. This is being brought home by the fact that several US companies, including McCain's, Lamb, Weston and Simplot, are drawing up plans to invest in India. The common factor in these medium-sized companies is that they specialise in potato processing, especially for fast food chains serving French fries.

These firms also have exclusive contracts with MacDonalds, Kentucky Fried Chicken and Wimpy for the supply of processed potatoes to them. With the latter two chains having begun operations in India and Big Mac intending to set up base here, companies like Simplot are hoping that Indians will soon get hooked on to

French fries.

Richard Hebel, chairman, Key Technology Inc. on his maiden visit to India, maintained that while Americans still love to bite into a burger, the demand for fast food in the US is tapering off, making food processing companies look for greener pastures.

Hebel is scouting for a joint venture partner for Key Technology, which manufactures food processing machinery. Key Technology will also supply vibratory machines and sorting equipment for fruits, nuts, coffee and rice.

PEPSICO VIOLATING WTO RULES

KR Malkani (BJP) today alleged that the multinational Pepsico had violated

World Trade Organisation (WTO) rules by growing a basmati rice variety in the United States without permission from India or Pakistan the only countries where this rice is grown.

Raising the issue in parliament, Malkani urged the government to take up the issue in the WTO alone or along with Pakistan as the United States had not paid any fee as required under the Trade Related Intellectual Property Rights (TRIPS) agreement.

Deputy chairman Najma Heptulla observed that the matter was serious as it amounted to theft of germ plants native to a country.

TAMARIND PROVES ITS MULTI-FERROUS VALUE

Tamarind, the sour fruit used as a condiment in every south Indian kitchen, could

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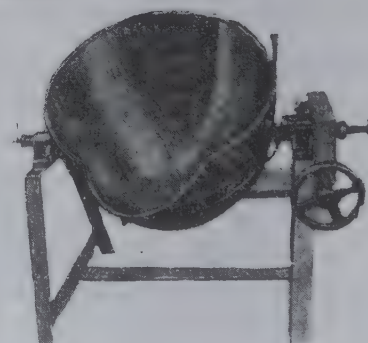
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sweeten the lives of those having a tree in their homestead as scientists have found a wide range of applications, including medicinal use, for every part of the tree from fruit to dead leaves, thus adding to its commercial value.

The essential ingredients in chutneys, sambars and currys, tamarind could be grown as a spice by farmers since a tree has a potential to fetch Rs. 400 to 800 per annum for the grower without any input costs, says agricultural scientists.

The tamarind pulp, preserved by adding 10 per cent salt, is used as a souring agent in sauces and beverages and for seasoning several other food items. It is the most acidic natural product, which also has medicinal and industrial uses.

According to Dr. P.K. Rajeevan and C.K. Geetha, scientists at the Kerala Agricultural University, it is a refrigerant, carminative and laxative given as infusion in biliousness and febrile conditions. Because of its antiscorbutic properties, pulp was used by sailors instead of lime or lemon juice, they said.

Besides the pulp, others parts of the tamarind tree, too have varied uses. The kernels have been used as food in times of famine, along with or mixed with cereals flour. Tamarind kernel powder (TKP) is extensively used as sizing material in textile and leather industry and the polysaccharide jellose in tkp forms gels with sugar concentrates, which is an excellent substitute for fruit pectins in the manufacture of jams, jellies and marmalades, the scientists say. It has various other applications such as an adhesive in book binding, cardboard manufacturing and in plywood industry. It is also employed as an auxiliary in dyeing and tanning and for polishing and cleaning metalware.

The seeds are as a source of carbohydrates for paper and jute products and for processing vegetable gum, while the fatty oil, extracted from the seeds, can be used in paints and varnishes.

Tamarind wood, which is used for making agricultural implements, tool-handles, wheels, mallets and rice pounders, is suitable for making printing blocks and tent-pegs.

The beautiful grains in the wood has made tamarind wood planks a big draw for decorative panelling and for furniture making, apart from its varied structural applications.

The trees tender leaves, flowers and seedlings are eaten as vegetables and used

as fodder for cattle. Even the withered and dry leaves are used as leaf mould, while the flowers are a good source of honey, the scientists say.

The medicinal properties of tamarind seeds and leaves are wide ranging. Powdered seeds of coriandum sativaum linn added to tamarind leaves, cooled in curd, along with pomegranate leaves and ginger is a cure for piles.

QUAKER OATS, PROPOSAL FOR 100% SUBSIDIARY REJECTED

The Indian Government has rejected Quaker Oats' application to set up a 100 per cent subsidiary in India, according to India Food Packer. Initially, the government had deferred its proposal suggesting that Quaker find an Indian partner or dilute some equity within six months of the approval. The company, however, had insisted instead on its original plan. Following this, the government had begun to go slow on proposals which do not involved a local partner. Up till today, the government has been scrutinising proposals. While some companies like Coke and Sony have got the approval to set up wholly-owned subsidiaries, other MNCs like Wrigleys and Reebok have been rejected.

Quaker Oats, a manufacturer of value-added food products and beverages, had actually planned to commence its operation with the introduction of its range of beverages starting with Gatorade. Gatorade is a non-carbonated beverage which has more than 80 per cent of the sports drink market in the US. Following Gatorade, Quaker Oats' mixed tea and fruit beverages under the brand name Snapple would be introduced.

The US\$6 billion company had proposed to invest US\$20 million in this project. For its beverage operation, Quaker Oats had proposed to set up an Indian company - Quaker Oats India Pvt. Ltd - which was expected to have bottling facilities across the country by the year 2000. This new company was supposed to provide equipment and assistance to local entrepreneurs to manufacture the beverage product.

WINE FROM PAPAYA

A technology has been formulated to make wine from papaya, according to the Dean of the Agricultural College in Madras, Dr. S.Purushothaman. After removing the latex and skin of the papaya through a process formulated by them, wine with 7.9 per cent alcohol could be obtained.

CRACKDOWN ON SPURIOUS MINERAL WATER

The government is cracking down on India's booming mineral water industry following complaints of tap water being passed off as mineral water. Several mineral water samples have been sent to research labs in the capital for testing. The Bureau of Industrial Standards (BIS) has also been sounded off to prepare a set of quality and process norms for the industry.

LOBBY FOR USE OF MOLASSES

Some of the liquor multinationals are lobbying with the government over the issue of grant of permission to manufacture liquor using molasses. Though the industry ministry has no objection on the manufacture of liquor using molasses, the chemical ministry and the food processing industry are against its use.

Industry ministry has proposed that for joint ventures involving foreign investors in the potable alcohol sector, no condition would be imposed about the use of raw material, if the license of the domestic partner does not already carry such a condition. However, the chemical ministry has vehemently opposed it.

In a letter dated March 23, 1996 to industry ministry, officials of the chemical ministry said the proposition of industry ministry to delete the condition of non-molasses has come as a surprise to the ministry.

Sources said ministry of FPI gave the permission to foreign investment in this sector to promote manufacture of alcohol from non-molasses based raw materials only. The government has so far followed an arbitrary policy in this regard. Where on one hand some multinationals like Seagram, Hiram Walker and White and Mackay are manufacturing liquor making use of non-molasses, other multinationals such as International Distillers and Vinters and Macdonald and Muir are manufacturing liquor using molasses.

The price factor has a major role to play in the use of molasses.

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COMPANY NEWS

FRESH COCONUT PRODUCTS

Fresh Coconut Products Ltd., (Freshco), India's first integrated value-added commercial plant will be commissioned shortly at Kadupissery in Trichur District of Kerala. In the first phase of the project, the company will manufacture products like coconut cream, coconut milk and coconut chutney powders. Freshco also plans to bring other value-added products from coconut like beverages, vinegar and spray-dried coconut milk powder etc.

According to Mr. Thomas Parappully, the technology for the project was developed by Regional Research Laboratory (RRL), Trivandrum (CSIR Unit) and expertise and support have been provided by the Coconut Development Board, Ministry of Agriculture, Government of India. RRL conducted research for more than 8 years to perfect the technology which was transferred to Freshco for commercialisation.

The target consumer population for Freshco Products is the middle class and upper class households in urban areas. Processed coconut cream would save a lot of manual labour and the advantages are convenience in usage, time saving, long shelf life, no cholesterol, pesticide residue free, nutritious and hygienic. Another important aspect is, no preservatives are used in its preparation.

Freshco's current production is from its existing pilot plant, and its commercial plant at Kadupissery will have a capacity to produce 3 lakh tins of 200 ml., a month.

The company is concentrating on two markets simultaneously - institutional and household. The company is expecting a turnover of Rs. 2.78 crore with a profit of about 15% in its first year and hopes to achieve turnover of Rs. 6 crore by the third year.

Freshco hopes to double the capacity from 12,000 coconuts to 24,000 coconuts per day and will introduce coconut-based beverages in 200 ml tetrapacks with capacity of 15,000 tetrapacks a day. It has also plans to increase the capacity of all other allied products.

NUTRINE CONFECTIONERY

Nutrine Confectionery Company Limited, flagship of the Nutrine group, is planning to launch its complete range of biscuits in North India. It also launched the biscuits in Maharashtra excluding Mumbai.

The company has also started exporting biscuits recently.

Nutrine's biscuits have been a success in the South, with the turnover from biscuits alone crossing Rs. 25 crore. Nutrine biscuits comprise milk, glucose, salt, spicy

and cream varieties.

The company is planning to increase the capacity from the existing 700 tonne per month. The company's plants are located at Chittoor, Madrapalli and Pudukottai.

Nutrine has already diversified into chewing gums, instant foods and fruit pulp, fruit bars of mango, papaya, apple, guava varieties, besides confectionery. Nutrine has more than 70 varieties of candies, toffees and lozenges.

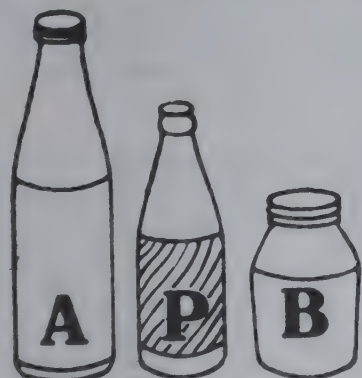
In confectionery, Nutrine enjoys a market share of 36 per cent in the organised sector. The guava and papaya bars are reserved for the export market, and are not sold in the domestic market.

This year's export turnover is likely to notch Rs. 70 lakh, up from last year's Rs. 12 lakh.

Nutrine's products are being exported to New Zealand, Canada, the US, Jamaica, Singapore, Trinidad and the Middle-East.

The existing capacity of the confectionery plant at Chittoor in Andhra Pradesh, is 2,000 tonne per month.

Chittoor lies in an advantageous horticultural belt where tropical fruit like bananas, mango and papaya grow in abundance. The company is keen to become a leader in processed foods, vegetables and



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fruit processed products.

Another plant is located in Bangalore with a capacity of 300 tonne.

Nutrine has developed an innovative technology for production of dehydrated fruit bars, organic fruits, etc.

BHANDARI FOOD FLAVOURS

Bhandari Food Flavours Limited is engaged in manufacturing of pure spices, masala pastes and powder, aqua mineral water and sauce. Mr. G. Ashok Bhandari is the chief promoter. He has been recently conferred with Rashtriya Udyog Award for the year 1994-95 by the International Economic Forum for excellence in the food processing industry.

The company proposes to set up a unit for coconut-based products with an installed capacity to manufacture coconut cream at 2,304 TPA, dessicated coconut powder at 1,200 TPA, coconut oil 1,170 TPA and coconut water 1,500 TPA.

The technology for the project and the major plant and machinery are proposed to be acquired on a turnkey basis from Sangram Engineering Limited, Pune. The cost of the project is estimated at Rs. 730 lakh.

SHETKARI SOLVENT

Shetkari Solvent (India) Limited, a soyabean processing group promoted by over 3,000 farmers, completed their plant expansion from 150 TPD to 200 TPD of refined soyabean. With a 12.5% dividend declared during fiscal 1994-95.

RABHA PLASTICS

Rabha Plastics Ltd, an existing unit engaged in manufacture of HDPE/PVC bottles, jars and containers, etc, proposes to expand its capacities.

The company proposes to expand its blow moulding and injection moulding capacity by 1470 tonnes per annum at an estimated cost of Rs. 600 lakh.

It has already tied-up with KID's R-US, Hong Kong for equity participation of Rs. 20 lakh and for the export of goods up to Rs. 400 lakh which forms nearly 60 per cent of the total capacity of injection moulded items.

MODERN FOODS

The public sector Modern Food Indus-

tries (India) Ltd signed a memorandum of understanding (MoU) with Protein Technologies India Ltd, an affiliate of the American Protein Technologies International Inc. for developing suitable high nutrition products for India's nutrition support programme, popularly known as the Midday Meal Scheme. The MoU was signed by the Chairman of Modern Foods and Chief Executive of Protein Technologies in the presence of Minister of State for Food Processing Industries K.P. Singh Deo and US Ambassador Frank Wisner.

While several public and private sector agencies are associated with the implementation of this programme, Modern Food Industries (India) Ltd is the nodal agency responsible for assisting and advising State Governments in selecting, manufacturing and distributing nutritious food products for the Midday Meal Scheme.

CADBURY SCHWEPES

World chocolate and confectionery consumption will rise by an average 2.5 per cent per year between 1994 and 2000. Dominic Cadbury, Chairman of Cadbury Schweppes Plc, said recently. Cadbury was addressing a conference on the prospects of both mature and emerging confectionery markets.

Mature markets would grow by between 1.5 and two per cent and emerging markets by four per cent a year, Cadbury told the international trade fair ISM.

The current annual per capita consumption of confectionery was pegged at 2.24 kg.

FLEXO FILM WRAPS

Flexo Film Wraps (India) Limited, a listed profit making company from Aurangabad, is expanding. The project is appraised by ICICI.

The company belongs to Thirani Group and it is headed by Mr. Kunal Thirani. The company is said to be the pioneer in manufacturing stretch and cling film in India.

The company's products Klin Wrap is a PVC-based stretch and cling film. It is transparent, glueless and a self sealing film. It has higher tensile strength compared to other stretch films. These film have various applications in different industries. It is used in hotels for wrapping complimentary fruit baskets, cooked and uncooked foods. It is also used by flight

kitchens, restaurants, fast food centres, caterers and exporters.

LANYARD FOODS LTD.

Lanyard Foods Ltd (LFL) is setting up a manufacturing unit for high quality coconut oil at Cochin with a copra crushing capacity of 32 TPD (tonnes per day) and extraction capacity of high quality coconut oil of 20 TPD along with in-house oil packaging material manufacturing facility of plastic bottles and tins for captive use. The total cost of the project, as per the appraisal of Bank of Madura Ltd., is Rs. 5.15 crore. As per the projections made by Bank of Madurai, the company will achieve a turnover of Rs. 19.57 crore and Rs. 23.12 crore for the financial years 1996-97 and 1997-98 respectively.

AMITY AGRO

The Andhra Pradesh-based Amity Agro Products is setting up a project to manufacture high value-added spice oils and oleoresins.

The installed capacity of the facility will be 1,800 tonne of raw material per annum at Surampally, near Vijayawada. The total project cost is estimated at Rs. 5.9 crore. Commercial production is expected to commence by September 1996 and the company plans to export its entire production.

Speaking at a news conference in Madras recently Ravi Kumar Neeladri, Managing Director of the Company, said that the oleoresin industry in the country has carved a niche in the world food processing industry and is able to cater to 50 per cent of the global demand.

In recent years, the consumption of oleoresins and spice oils has been on the rise mainly in developed countries such as the US, UK, Germany, Canada, Australia, France and Japan.

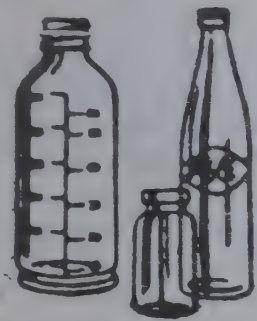
The international trade in spices is estimated at 3.5 to 5.7 lakh tonne and in value terms is equal to \$1,000 million.

Besides this, a 15 per cent annual growth rate is envisaged for the next decade. India has exported around 1,300 tonne of spice oils and oleoresins, which are valued at Rs. 75 crore.

The company's product range includes pepper.

Regarding competition, there are eight other companies in the field and a major-

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ity part of the industry lies in the unorganised sector.

When asked if the company intends to sell its product with a brand name, Neeladri informed that Amity, within the next four or five years, will market their products with a brand name in the domestic market.

MARICO INDUSTRIES

Marico Industries Limited, a leading producer of cooking oil, hair oil and fruit jams, expects to maintain volume growth of about 25 per cent in the coming years. It hopes to be a Rs. 500 crore company in couple of years, according to Mr. Harsh Mariwala, managing director. The company attained sales of Rs. 284 crore during 1994-95.

PARLE/COCA-COLA

The three soft drink brands - Thums-Up, Limca and Gold Spot - taken over by the US multi-national Coca-Cola, will now be available in 330 ml cans and PET bottles.

The head of the Parle group, Ramesh Chauhan said, that these soft drinks in metal cans are being launched to cater to the growing demands of the domestic market.

He further added that the company plans to rely on the existing bottlers to manufacture these canned soft drinks and with sales growing at 30-35 per cent every year in volume terms, the company would be in a position to gain a greater share of the market.

GUJARAT CO-OP.

The Gujarat Cooperative Milk Marketing Federation (GCMMF) Ltd., maker of

the Amul brand, has added ice cream to its already vast repertoire of brands. The Amul brand of ice cream was launched recently in Gujarat.

The ice cream is available in typical Indian flavours. According to a company spokesperson, "we are checking out the Ahmedabad market before going national." The new offering is likely to be priced competitively, on par with existing brands such as Vadilal.

The new offering has been in the pipeline for almost three years now. It now completes GCMMF's dairy range that already includes cheese, cheese spread, butter, ghee, milk and chocolates. Given the track record of other Amul brands, the private sector is in for some hot competition this summer.

COASTAL CHEM

The promoters of Coastal Chemicals Ltd., which manufactures alum-ferric and non-ferric in Visakhapatnam are setting up a speciality chemicals unit at Gowripatnam village in West Godavari district, at an estimated cost of Rs. 22.20 crore.

Subhodaya Chemicals Ltd would be manufacturing 1,500 tpa each of di-ethyl sulphate (DES) and benzene sulphonyl chloride (BSC) at the plant, according to Mr. S.V. Chaudary, a director of the company.

Both DES and BSC are import-substitute products used in dyes, plants and pharmaceutical industries. While the demand for DES was estimated at 3,650 tpa, the supply was only about 1,000 tonnes. Similarly, the demand for BSC was 3,000 tpa, while supply was to the tune of 1,000 tonnes, he said.

The unit would also be manufacturing sulphuric acid, liquid sulphur trioxide and

chloro sulphonic acid, but they would be consumed internally.

UNITED BREWERIES

India's brewery giant, United Breweries has entered the traditional British Lager market in a big way by introducing a second new brand of beer — 'Kalyani export special' in Britain.

Branded as the truly original Indian Lager, Kalyani beer is being imported directly from India and distributed in the United Kingdom and Continental Europe by UBSN Ltd, the joint venture company between United Breweries and Shepherd Neame of Faversham, one of the oldest British Breweries.

Although targeted primarily in the United Kingdom Indian restaurant trade, Kalyani will also be available for the take home lager sector, said David Townshend, Managing Director of the UBSN Ltd.

He said the first Indian lager 'Kingfisher' which was introduced in England way back in 1989 had outstripped its demand and thus the need for introduction of the second Indian Lager.

Speaking at a launch of the Lager, Townshend said Kalyani brewed in the time honoured traditional manner would compliment the flavours of Indian cuisine.

He said that the Kalyani with the fast selling Kingfisher beer would be retailed to over 5,500 of the 6000 Indian cuisine restaurants in United Kingdom.

He said that United Kingdom would serve as the base for launch of the Kalyani Lager to much of Continental Europe, United States and Canada.

VINTAGE FOODS

Vintage Foods and Industries Ltd, a

city-based company engaged in manufacturing 100 per cent vegetarian, fresh and pure milk products such as cheese, ghee and paneer, is embarking on an expansion programme.

The company promoted by N.K. Mohta has recorded 2600 per cent growth in turnover from Rs. 24.19 lakh in 1992-93 to Rs. 6.3 crore in 1995. Profits of the company have gone up from Rs. 0.23 lakh in 1992-93 to Rs. 1.53 crore in 1995.

Vintage is one of the largest manufacturers of the highly popular Mozzarella cheese in India besides being the leading marketer of a variety of cheese to the star hotels and large departmental stores in the major cities of the country.

The company has entered into an MoU with the Qatar-based Sterling Catering Services for 100 MT of mozzarella cheese per month.

The company has a growing chain of retail outlets in India spreading across the country.

The Indian Dairy Industry valued at Rs. 30,000 crore is expected to treble by 2000 A.D. It is the second largest in the world, next only to the US.

In view of the immense growth potential of the industry, the company is now going in for expansion in the milk processing capacity to 1.75 lakh litres per day, enabling it to manufacture 10 tonne of quality cheese per day.

The fully integrated dairy complex, estimated to cost about Rs. 13.5 crore is to come up at Devanahalli, falling in the milk-rich belt bordering Tamil Nadu, Andhra Pradesh and Karnataka. KSIIDC has already sanctioned Rs. 3 crore as term loan.

The company has been offering a scheme of benefit to existing shareholders involving 5% discount on purchases of all the products of the company. The company has decided to extend this facility to those who become the original shareholders in respect of all the further issues of shares by the company. This has been evolved as a corporate philosophy and as a concept of "part ownership" Mohta claimed.

GOODRICKE GROUP

Goodricke Group Ltd., a Lawrie group company, has staged a remarkable recovery in the second half of the year 1995 to post a profit of Rs. 1.7 crore on an annual turnover of Rs. 116 crore. The company

has sunk into losses of over Rs. 11 crore in the first half of the year, ended September 1995.

A substantial improvement in the tea crop in the second half of the year coupled with better price realisation propelled the company from substantial losses to a satisfactory profit level. With the tea crop in the current year promising to be better and also exports of India teas looking up, Goodricke hopes to post much better results in the current year, according to Mr. S.K. Bhasin, the company's managing director.

In the current year the focus will largely be on the new instant tea plant commissioned in Dooars, a 100 per cent export oriented unit. The project which was set up at a cost of approximately Rs. 12 crore would be manufacturing 6 lakh kgs of instant tea powder both hot and cold water soluble product for overseas markets in the US and Europe. The stress will also be on value-added quality teas both for domestic as well as foreign markets.

Mr. Bhasin said that even though in the year ended December 1995, there was a relatively lesser focus on exports, it was still possible for the company to attain a Rs. 22 crore export against Rs. 12 crore in the previous year. With export market for Indian teas showing signs of recovering now, the company intends to once again turn its serious attention on overseas markets.

Scoffing at rumours that the company may change hands in the near future, Mr. Bhasin said that the new instant tea venture and investment in the Nepalese joint venture were pointers to the serious intention of the Lawrie group to remain entrenched in India.

SUNNYDALE FARMS

The Pune-based Rs. 30 lakh processed meat manufacturer, Sunnydale Farms Products is all set to expand operations and export up to 40 tons per month of such produce to Dubai. Managing Director Cyrus Patel who is being wooed by the Ahmednagar-based Damani's for his processed chicken meat products, said a possible tie up was still some way off. Patel, who is currently in the process of increasing installed capacity for processed meat products "twenty fold" in one shift, said his new plant would be operational in a couple of months.

The new unit, coming up in the fast growing suburb of Kondhwa, will have the capacity to process 1 ton of meat per hour,

amounting to 8 to 10 tons a day, in one shift, he added.

An export demand and the growth in the local market for ready-to-use convenience foods had led to this increase in capacity.

The family-owned company has developed a speciality line in processed chicken, mutton, beef and pork products. Patel said they had about 40 lines in the meat business and were in the process of adding more product lines to their existing convenience food business. Currently, they have 10. The thrust for Sunnydale, Patel said, would be to provide a variety of products with a long shelf life.

PEPSICO

The Jaipuria group is commissioning a new bottling plant to cater exclusively to Pepsi Co. The plant is being set up about 20 km from Jaipur, on the Jaipur-Ajmer highway. According to Ravi Jaipuria, the youngest of the Jaipuria brothers, the plant will become operational soon.

With this the number of Pepsi's bottling plants in the country will increase to 28. The Jaipur plant will bottle all the brands in PepsiCo's stable - Pepsi, Mirinda, Teem and Soda. The total cost of the project is Rs. 20 crore. The Jaipurias have been in the bottling business since 1965 and have bottled for all the major soft drink companies.

QUALITY TEA PLANTATION

JV Netherlands, the largest producer and processor of potato and potato products in Europe, has entered into a joint venture with Calcutta based Quality Tea Plantation for producing and processing potato products.

The project will come up in West Bengal, and the investment planned in the first three years is \$ 300 million. As per the agreement, the foreign partner will bring in hybrid seeds for cultivation of superior quality potatoes. These potatoes would be processed to produce various preparations like flakes and creams.

PARLE

Parle, the makers of Frooti and Bailey mineral water has joined hands with Husky Injection Moulding Systems of Luxembourg and SIDEL, France, to manufacture PET bottles in India.

The installed capacity of the proposed

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unit which is scheduled to be commissioned in Mumbai by July 1996, would be around 100 million preforms per annum, and will involve an estimated capital outlay of over Rs. 50 crore.

The company with its franchise network, plans to develop satellite blowing stations which would be situated in Mumbai, Gujarat, Delhi, Calcutta, Bhopal among others.

The new Husky-SIDEL technology would comprise the preform making Husky machine and the stretch blow moulding machine from SIDEL. Husky Injection Moulding Systems is a company with a group turnover of over \$ 600 million, whereas the turnover of SIDEL during 1994 stood at over \$ 570 million.

Among the various brands, Frooty today commands a market share of 86 per cent in the tetrapak segment and has grown 35 per cent in volume terms during January-December 1995, whereas its mineral water brand Bailey had recorded a growth of 180 per cent and has a market share of 35 per cent.

CAREW PHARMACEUTICALS

Carew Pharmaceuticals, the Calcutta-based UB Group company, has announced major plans to develop and market all over India, a wide range of unique herbal health and beauty care products.

The first two amongst these are "UB FIT" which is chyawanprash packaged in the form of a toffee, and "UB Balm", a powerful analgesic balm which is non-greasy and non-staining.

VIMAL GROUP

The Mehsana based Rs. 150 crore Vimal group, active in the field of engi-

neering and edible oils, has diversified into the manufacture of dairy products.

It has floated a new company Vimal Dairy Ltd to manufacture them, revealed Mr. Jayesh Patel, a director of the company while speaking to the press.

The company has made an investment of Rs. 7.5 crore in its dairy plant near Mehsana. The milk processing capacity of this plant is 1 lakh litres per day. The company plans to double this capacity and also put up a spray drying plant this year, Mr. Patel added.

This expansion will entail an investment of Rs. 12 crore. Of this Rs. 6 crore will be raised through a public issue. The rest of the amount will be the promoters' contribution and a loan from IDBI, he added. The milk will be sold only in Gujarat, whereas the dairy products will also be marketed in Maharashtra and Rajasthan apart from Gujarat, he said.

MCDOWELL

The No. 1 McDowell's whisky, the flagship brand of McDowell & Co, a part of the UB group's spirits division has crossed the two-million case mark during the financial year 1995-96, according to a press release issued by the company.

DHRUV MAHAJAN (INDIA)

Dhruv Makhan (India) Ltd. (DMIL), incorporated in 1994, is setting up a dairy plant with an installed capacity of 9,900 litres per day for manufacturing value-added dairy products like pasteurised milk, flavoured milk, ghee, casein, butter, cheese and khoa, for which the company is going public. The company has been promoted by Navin R. Thakkar and Shailesh R. Thakkar, who have some experience in the field. The plant will be located 30 kilome-

ters from Ahmedabad. The company has taken around 115 acres of land on lease basis for a period of three years, at Rs. 3.45 lakh per annum. Out of the total project cost of Rs. 10.05 crore, Rs. 3.70 crore will be spent on the plant and machinery, but the company is yet to place orders for a major part of the plant and machinery. An amount of Rs. 2.96 crore has been kept aside for the purchase of live stock for 800 buffaloes and 1,000 cows. For marketing purposes, the company will have arrangement with small retailers, hotels and restaurants in Gujarat and Mumbai. It will have to face competition from existing players like Amul, Vadilal, Gokul, Gayatri, Royal and Uttam.

VADILAL

The Rs. 60 crore ice-cream and dairy products company, Vadilal Dairy International Ltd, is doubling the capacity of its ice-cream unit at Tarapur, in the outskirts of Mumbai, to meet the growing demand.

Vadilal, which notched up a growth of 30 per cent in 1995-96, is increasing its capacity from 2,700 tonnes to 5,400 tonnes per annum. The expansion would be completed in the next couple of years.

The cost of expansion is around Rs. 7 crore, which is being met from internal accruals, according to Mr. Shailesh R. Gandhi, managing director, of Vadilal Dairy International Ltd. Mr. Gandhi said that Vadilal today has a market share of 38 per cent in the Mumbai market which is dominated by the Kwality Walls combine, which has a share of 44 per cent.

VEERAMANI BISCUITS

Veeramani Biscuit Industries Limited (VBIL), has embarked on a Rs. 11 crore expansion-cum-diversification plan, to expand its capacity and diversify into other

areas.

The company, engaged in the manufacture of biscuits, is enhancing its capacity from the existing 6,000 tonnes per annum to 18,000 tonnes per annum. The expanded capacity has been planned at its Turkayamjal plant near Hyderabad, for the manufacture of premium biscuits for the export market and general variety of biscuits for the domestic market.

The company has entered into a marketing agreement with Cash-n-Carry Supermarkets, Sharjah, UAE for marketing 50 per cent of its premium biscuit brand "Trinity" in the Gulf countries. Besides this, the company would also be exporting to African and Russian countries.

ENKAY TEXOFOOD

Enkay Texofood Industrieis, the Rs. 200-crore company producing fruit pulp, purees, juice concentrates and aromas, has become the first Indian fruit processing company to receive the ISO 9002 certification, according to Murli Goyal, its managing director. The licence, valid till 31st of January 1999, is renewable as per the regulations of the Bureau of Indian Standards.

Attributing this achievement to the quality standards observed at Enkay, Goyal said, "Our plant, commissioned in 1989 with technology from M/s Henschel Export GmbH of Germany, is approved by the Food & Drug Administration (FDA) of USA. The process equipment, imported from Germany-based M/s. W. Schmidt bretten GmbH, are also of the best quality available." Enkay is also the only Indian member of SGF, an organisation of fruit juice manufacturers from the European community propagating EQCS (European Quality Control System), Goyal added.

According to Goyal, Enkay is heading to achieve 400 per cent growth in the coming years. "We are aiming to become the largest global mango processor by the first quarter of 1998," he said.

BFL

Bfl UNIO Ltd., the SN Bangur group company has tied up with General project estimated to cost Rs. 12 crore.

The project is targeting the 'summer of 1997' for the launch of its drinks in coloured plastic bottles, BFL UNIO general manager, Dev Gupta said. "At present, the soft drinks market is dominated by the

manufacturers of aerated waters, also known as carbonated drinks which add fizz to the drinks.

Since aerated water are harmful to health, the market for non-carbonated drinks is growing in India. We will be introducing these drinks for the first time in the country."

He further added that this would help the company capture a major share of the growing market for non-carbonated drinks. The project is targeting the segment of children up to the age of 14. Delhi apparently is the biggest market for such fruit drinks and the company is now in the process of finalising its market research for selecting the project site.

General Mills of the US, which is into virtually every segment of the food processing industry in the country had a turnover of over Rs. 1,600 crore in fruit drinks alone in the transatlantic region, during 1994. The US multinational will supply the complete process knowhow and also the packaging line for the project being set up by the Bangurs.

"In the second stage, we will have franchisees to bottle our drinks with technical assistance from us," Gupta added.

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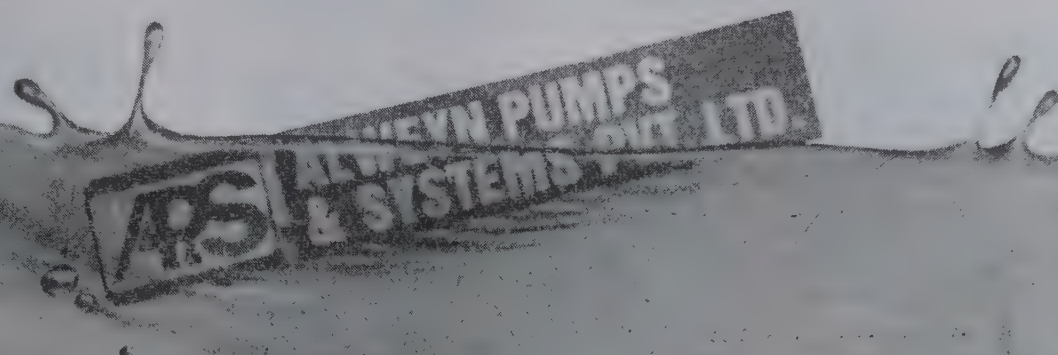
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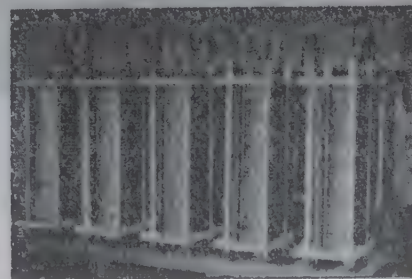
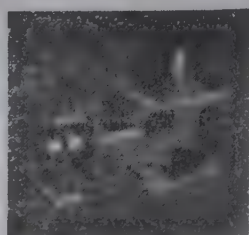
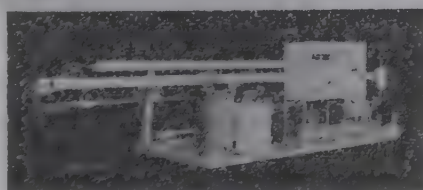
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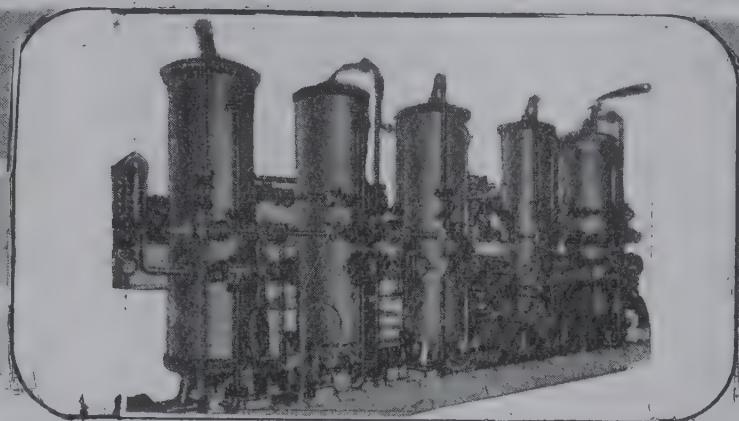


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EXPORT HIGHLIGHTS

SPICES

Chilli exports from India have registered an all time high of 39,850 tonnes valued at Rs. 132.03 crore during the period from April to January in 1995-96.

The rise in exports of chilli during the year was mainly due to the increased imports like countries in UAE and Pakistan and better intake of Indian chilli by traditional buyers like Sri Lanka, Singapore and the US.

Spices Board figures indicate that ginger exports in the first ten months of the current financial year almost doubled in terms of value to touch Rs. 24.98 crore while quantity has increased to 11,650 tonnes from 8,572 tonnes. This was due to the increased exports of ginger to the Middle East and fresh ginger to Bangladesh, according to sources from the Board.

However, pepper exports during 1995-96 are showing a declining trend during the current year when compared to the previous year. Pepper exports during the first ten months of the current fiscal were only 16,900 tonnes valued at Rs. 177.16 crore. Meanwhile, valuwise Indian pepper stood at Rs. 76.35 a kilo in the previous year.

The Board figures show that spices exports from India in the first ten months ending January 1996 were 1.45 lakh tonnes valued at Rs. 551.56 crore as against 1.25 lakh tonnes valued at 475.25 crore during the same period last year.

According to Board sources, the spices exports were all set to achieve the target of Rs. 1.70 lakh tonnes valued at Rs. 636 crore by the end of the current financial year.

CLAM

Clam (kakka) farming which provides a return of 54 per cent has a growing export market and could be easily adopted by people living in coastal areas, according to K.A. Narasimhan, Head of Molluscan Fisheries Division of Central Marine Fisheries Research Institute (CMFRI)

India exported 900 tonne clam meat worth Rs. 292 lakh in 1993 compared to 371 tonne clam worth Rs. 63 lakh in 1989,

registering a five fold increase. The annual clam landing in the country is about 45,5000 tonne while the global production is over 7.65 lakh tonne. Kerala accounts for 72.5 per cent of clam production in the country followed by Karnataka.

CMFRI has developed technology packages for farming different species of clam. It is cultured on the bottom of protected coastal waters like bays, backwaters, and estuaries after transplanting seeds collected from natural grounds, Narashimham said.

Blood clam and black clam are the two major varieties found in India. Blood clam is suitable for culture in the East Coast and black clam in the West Coast. Blood clam culture in 1 hectare area with production cost of Rs. 2 lakh will yield meat and shell worth Rs. 3 lakh.

Similarly, black clam culture in 1 hectare will yield revenue of Rs. 1,90 lakh. Net profit on farming these varieties will be over 50 per cent, Narasimham said. CMFRI conducted a one day workshop for aquafarmers on clam farming on March 19, he added.

SOYMEAL

Indian soymeal exports to China have risen sharply from almost nothing to at least 4,00,000 tonnes in the first six months of 1995-96, Indian processors and exporters said recently.

Chinese buying interest remains strong as the second half of the November-October crop year begins, they said

But news lately of a possible reduction in Chinese soymeal import tariffs, which might spur increased Chinese demand, had not noticeably affected the Indian market, they said.

"The two major developments taking place in the Indian soymeal market are that China has become one of the major importers and increased exports to Japan," Mr. Davish Jain, chairman of the Indore-based Soybean Processors Association (SOPA) said. It may be pointed out that Indore is the centre of India's soybean processing industry.

"China, which hardly bought any Indian soymeal in the past, has become a significant, regular importer this year," Mr. Jain said, adding, "Commitments have been 4,00,000 tonnes between October and March. It could be more."

Previously, China imported between 10,000 and 20,000 tonnes of soymeal from India a year, he said.

India recently sold one or two vessels of 12,000 - 15,000 tonnes of soymeal to China for April shipment, exports said. Most deals are arranged out of the big multinational grain trading houses in Singapore and Hong Kong, they added.

Indian soymeal for export is currently bid at around \$230 per tonne, FAS West Coast in bulk, they said. China favours Indian meal because of its 48 per cent protein content and India's small shipments, which are less costly and can be accommodated at Chinese ports, they said.

Prospects for further meal sales to China, even if demand increases, could be hindered in the short-term by end-of-season tightness in domestic soybean availability, processors said.

An exporter said "March is the year-end for Indian companies, and we saw a lot of (soymeal) shipments in March. But there is an April shortage in sight, because the Indian soybean crop is definitely waning."

Soybean processing has come to a near standstill as soybean arrivals have slowed to a trickle.

Small and medium-sized farm in India's soybean growing regions have already sold their stocks, while bigger growers are hoarding supplies in hopes of higher prices later, traders said.

Mr. Jain calculated that about one million tonnes of Indian soybeans remained to be marketed this year. He estimated that 8,00,000 tonnes of soymeal will be produced from that quantity of beans, making about 6,50,000 tonnes of meal potentially available for export in the next four to five months.

But India's soybean and soymeal markets are expected to be quiet in coming weeks as other crops take precedence, processors said.

EXPORT OPPORTUNITIES

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J.K. Javid Trading Co., P.O. Box 15115/695, Tehran wish to Import all varieties of Spices (Whole).

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International Co. For Food & Live Stock, P.O. Box 7903, Doha. Importers of Food Items (Frozen and Dry).

S. AMERICA

M.M. Kem Majeed International, 87, Barrack St., Kingston, Georgetown, Guyana. Importers of Foodstuff (Chick Peas etc.)

SINGAPORE

Tako Associates, Tampines South,

P.O. Box 0219 Singapore wish to import Dried Sea Cucumbers, Dried Sea Horses and other Dried Seafoods.

The Sagar Trading Co., No. 10, Anson Road, International Plaza #17-09, Singapore 079903. Tel: 2248816, Tlx: RS 23206 BAKUL. Fax: (65) 2242 706. Importers of Spices and General Merchandise.

SOUTH AFRICA

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BOOK REVIEWS

ANALYTICAL TECHNIQUES FOR FOODS AND AGRICULTURAL PRODUCTS. Published by VCH, P.O.Box 10 11 61, D-69451 Weinheim, 1995. Ca 500 pages. Hardcover. Price : DM 215.00

This is the second volume in the 4-volume set Analysis and Control Methods in the Food Industry, edited by J-L. Multon.

The book describes all the main analytical techniques used in the food industry. Physical and chemical principles underlying the techniques are reviewed, and the limitations of the techniques and their field of application are defined.

The scope is unusually wide, encompassing physical, chemical, engineering biochemical, toxicological, and sensory analysis techniques. It presents a wide variety of analytical methods, including those based on spectroscopy, chromatography, electrophoresis, thermal analysis, electrochemical analysis, rheology and molecular sieves.

Contents : Part I : Physical Techniques; spectrophotometric techniques/ Other optical and spectroscopic techniques/ Image analysis techniques/ Chromatography/ Electrophoresis/ Thermal Analysis/ Electrochemical techniques/ Rheological techniques/ Methods of particle size analysis/ Complex and expensive instrument techniques; **Part II:** Biochemical techniques; Enzymatic analysis/ Immunochemical analysis techniques/ Microbiological chemical analysis techniques; **Part III :** Sensory evaluation; **Part IV:** Nutritional and Toxicological Analysis techniques; Nutritional analysis techniques/ Principle of food toxic analysis/ Techniques of mutagenicity analysis.

FROZEN AND REFRIGERATED DOUGHS AND BATTERS. Ed. by Karen Kulp, Klaus Lorenz and Juergen Brummer, Published by American Association of Cereal

Chemists, 3340 Pilot Knob Road, St. Paul, Minnesota 55121-2097 U.S.A., Fax : 612/454-0766, E-Mail aacc@scisoc.org Pages : 288, Price : \$ 200 (Shipping and Handling extra)

To help food industry professionals keep pace with the latest changes in the marketplace—including the rise of supermarkets as bake-off sites, the growth of long-distance distribution pathways, and the need for longer shelf-life—this handbook presents an overview of the latest technological innovations in the application of frozen and refrigerated dough and batter technology as well as a thorough review of basic methodologies.

Frozen and Refrigerated Doughs and Batters is the only comprehensive guide to this important segment of the baking industry. The contributors are expert in the field who come from universities, research institutes, and companies in the United States and Europe. In 14 chapters, the contributors offer practical insight into application problems, including economic, technological, biochemical, rheological, microbiological, and engineering considerations. They cover topics from the principles of ingredient selection to recent patents and the physics of freezing, and they address differences between American and European practices.

Filled with guidelines for optical formula, process, and equipment selection as well as up-to-date charts and tablets, this text offers guidance to food industry professionals as they grapple with the central challenges of commercial baking, including: - ● developing profitable food products ● determining in which areas of the industry to expect growth ● boosting products quality ● learning which products, ingredients, and applications need improvement ● correlating general scientific knowledge with the specifics of formulating, preparing, packaging, and distributing frozen and refrigerated doughs and batters ● deciding on which topics to focus future

research ● training new staff.

FRUIT JUICES : A STUDY OF SELECTED MARKETS IN ASIA, Published by ITC, Palais des Nations, 1211 Geneva 10, Switzerland. Tel. (41-22) 730 44 39, Telex 414 119 ITC CH Telegrammes: INTRAD-CEN, Geneva. Free to Exporters, Importers and trade related organisations. Price: \$ 40. Pages : 106

Fruit juices imports into the eight leading Asian markets for this products group came to \$683 million in 1994, or about 14% of total world trade (\$4.87 billion). Japan is far the largest fruit juice importer in Asia, purchasing \$449 million worth in 1994, and it is also among the five largest in the world (with 9.2% of the 1994 total). Next in importance that year was the Republic of Korea, with imports of \$115 million, or 2.4% of the world total followed by Taiwan Province (China) with \$42 million; Singapore, \$31 million; Hong Kong \$24 million; Philippines, \$9 million; Malaysia, \$8 million; and China, \$6 million.

Imports of fruit juices into this group of market rose by 78% in value between 1990 and 1994. Of the four markets covered in detail by this study, Japan and the Republic of Korea are not only the two largest, but their imports also expanded the most rapidly during the period surveyed, by 75% and 87% respectively in value.

Developing countries and areas accounted for upto 48% of world exports of juices during the 1990-94 period. Brazil is by far the largest exporter of fruit juices (mainly frozen concentrated orange juices, but also other citrus and tropical Juices). Other major suppliers among developing countries include Thailand, Argentina, Mexico, South Africa, Chile, Philippines and Turkey, each exporting more than \$35 million worth of juices in 1994. Of the economics in transition, those in the same export range were Poland and Hungary.



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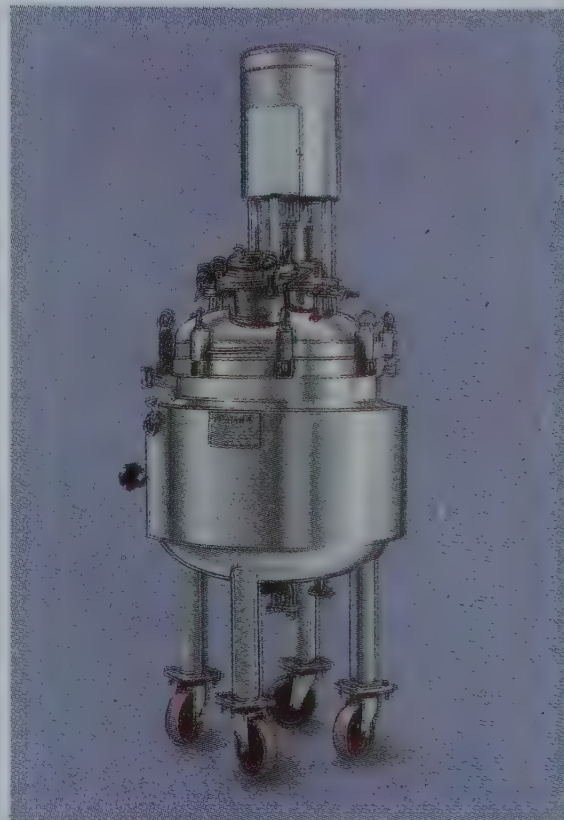
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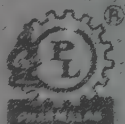
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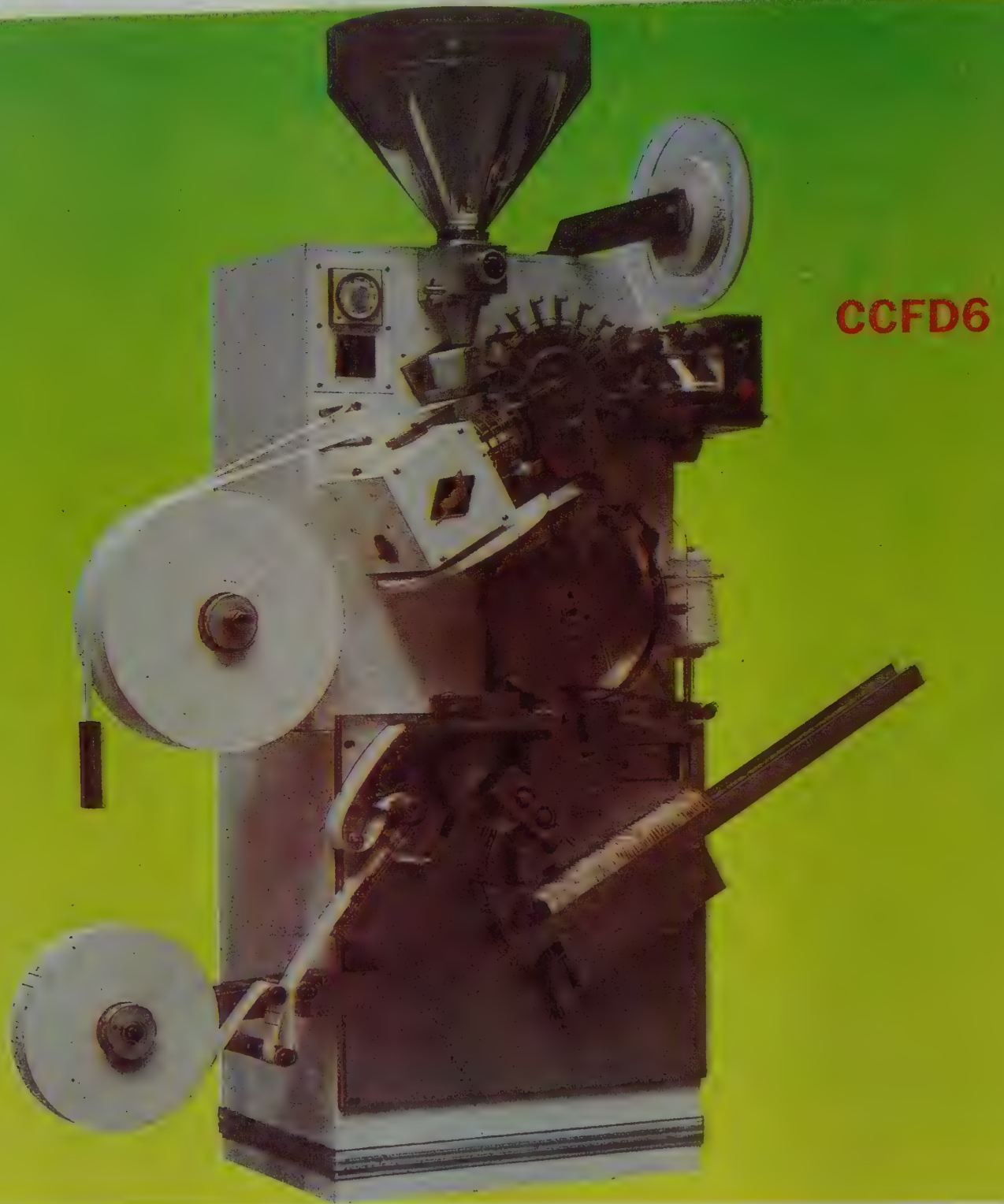
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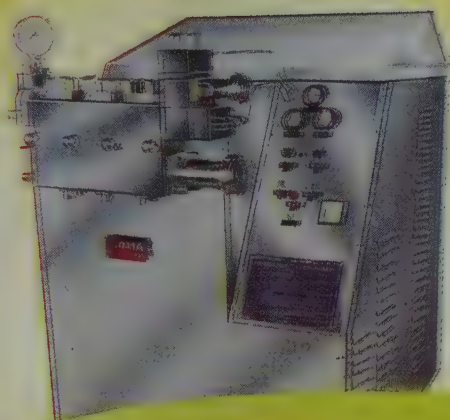


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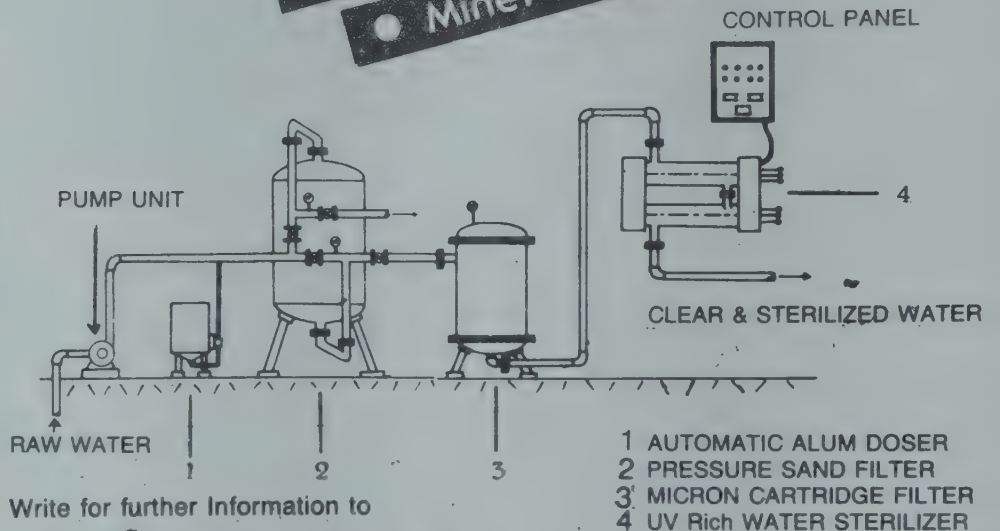
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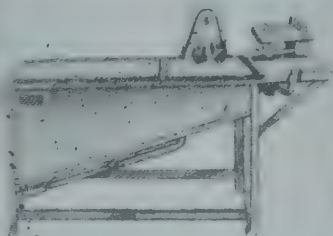
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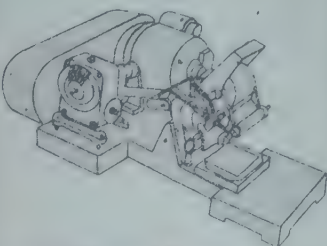
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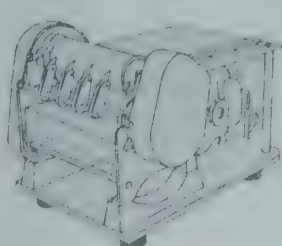
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TRADE FAIRS & EXHIBITIONS

METPACK '96

Venue : Essen, Germany
Date : 7 - 11 May, 1996

Metpack '96 - the world's premier show for the metal packaging industry has already received overwhelming support from both existing and prospective exhibitors.

Metpack '96 will coincide with Interpack in Dusseldorf - the prestigious general packaging trade fair - on three consecutive days (May 9, 10 and 11).

A close working relationship between the organisers of both exhibitions guarantees many benefits for those wishing to visit either event. One example of this is a direct shuttle between Essen and Dusseldorf which takes less than 20 minutes.

For further information contact:

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INTERPACK '96

Venue : Dusseldorf, Germany
Date : 09 - 15 May, 1996

The global top transposition event in the world of packaging that is **Interpack** - the 14th international fair of packaging machinery, is back after three years, bringing in great international demand. And it is a happy union of the global packaging market.

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In the year 1993, 2,236 companies participated in the fair and nearly 192,327 visitors attended the fair. In 1996 Interpack is expecting an even greater success.

Exhibit Profile : Interpack nomenclature covers no machinery or plants for the manufacture, finishing or imprinting of packaging material but packaging machinery in the strict sense. It includes 200

items for packaging machinery. That mainly touches the sectors like : • Food and luxury food industry • Pharmaceutical and cosmetic industry • Chemical industry • Confectionery industry • Biscuits industry • Drinks industry

Changing economic and technological trends of global significance are highlighted at the fair. In short, the tendency of future packaging markets and spurring development of technological innovations are projected at "Interpack".

A special group visit is organised by ORBIT for the benefit of packaging experts.

For more details contact :

**"ORBIT" 1127 Midway Premises,
A.S. Marathe Marg, Prabhadevi,
Bombay 400 025. Tel : 4379282 / 83
Fax : 4305705.**

LABELLEXPO ASIA '96

Venue : Singapore
Date : 8 - 11 May 1996

Forecasts from the OECD put GDP growth in Asia at three to four times that of Europe, North America or Japan - forecasts that should fuel even greater growth and investment in the Asian label market and bring pressures on both label producers and users to increase volume output, raise quality and performance standards and look for new labelling solutions.

Figures from leading international experts, such as Labels and Labelling Consultancy, show that self-adhesive labelling has experienced growth rates in Europe and North America of around 10% a year over the past ten years, virtually doubling in volume usage every five or six years since the mid 1970s.

As manufacturing and consumer growth expands so do the handling, warehousing, distribution and shipping requirements, today increasingly being met by self-adhesive labels which have been electronically overprinted with bar codes, batch codes, date codes, variable text or graphics, on new types of label printers using ink jet, thermal, laser or impact

printing technologies. In Europe, such labels now make up nearly 40% of all self-adhesive label usage. Additionally by the year 2010 more than half of the world's international airlines passenger services will originate or terminate in the Asian regions - and all requiring two three or more bar code or security label and tags.

The third Labelexpo Asia show takes place at the World Trade Centre in Singapore. With almost all the leading international label press and materials manufacturing exhibiting, as well as numerous international ancillary supplies and Asian-based suppliers Labelexpo. Asia has become the region's major showcase to which label printers from throughout the Asia Pacific region will attend.

Contact for more details :

**Rowena Suthers, Labelex Exhibitions
Ltd., 131 Southlands Road, Bromley,
Kent BR2 9QT, England. Tel : +44 (0)
181 313 3535, Fax : +44 (0) 181 468 7472.**

THAILAND FOOD FAIR '96

Venue : Bangkok, Thailand
Date : 6-9 June, 1996.

Thailand is one of the world's biggest and most important food producers and one of only five net food exporters in the world, with total food and beverage exports worth almost US \$8 billion annually. The Thailand Food Fair is co-organised with the Department of Export Promotion and has the theme "Thailand Catering For the World".

The Thai food industry has invested enormous sums over the years in developing a range of world class value added products which are well known for their high quality in markets all over the world.

Both the fast food and snack food markets are enjoying huge growth as consumers develop new tastes and increasing familiarity with convenience food concepts. The snack food is estimated at about US \$205 million.

Thailand has the fastest growing ice cream markets in the world. In 1989 the value reached to US \$200 million and is now growing at around 20% a year.

Thailand's wine markets has reached a value of US \$26.25 million last year. While the beer market is estimated to be worth some US \$ 4.8 billion a year and is expanding rapidly with 35% more in two years.

Exhibit Profile :

- Food and Beverage • Wine, Beers and Spirits • Interior Fittings and Furnishings • Leisure, Entertainment and Fitness • Dining and Table-top Equipment • Bakery Equipment and Supplies • Inflight Services • Franchising • Lighting

For booking / details, contact :

Mr. Greg Marucchi, Worldwide Agents, Overseas Exhibition Services, 11 Manchester Square, London W1 M 5AB, U.K. Tel : +44 171 4861951, Fax : +44 171 4138230 or Orbit International Trade Fairs, 1, Sapna Building, A.S. Marathe Marg, Prabhadevi, Mumbai 400 025. Tel : 22 422 9019/ 431 4156, Fax : 22 430 5707/ 431 4205

INDSPIRIT '91

**Venue : World Trade Centre
Date : 12-14 July, 1996**

More than a dozen foreign wine manufacturers will participate in "INDSPIRIT '96," the second annual liquor exhibition to be held under the auspices of *Ambrosia* (a liquor industry trade magazine).

Of great interest to the public will be a free sampling session and presentation of awards based on blind tasting. A one-day conference on 'challenges of liquor marketing in India' will also be held, coinciding with the exhibition.

The interest evinced by the foreign wine manufacturers is seen as an indication of the emerging perception of India as a potential wine market. According to the sponsors the perception abroad is that the rise in the income of the middle class and the change in the attitudes could make India a healthy market place for wines.

A number of them have completed their market survey also. Those who have already confirmed their participation include, Henkell and Sohnlein, a Germany company and Odesha Sparkling Wine from France. Currently, there are only three wine manufacturers in India, namely Indage India, Grovers Wine and Baramati Wines.

Scotch manufacturers from abroad, including White and Mackey, Grants and Inver House distillers too, have confirmed

their participation in the exhibition.

INTERNATIONAL POULTRY EXHIBITION 1996

**Venue : Pragathi Maidan, New Delhi
Date : September 4-8, 1996**

India is hosting XX World's Poultry Congress in New Delhi during September 2-5, 1996. This is the first time India is hosting such a prestigious Congress in the field of Poultry Science. On the occasion of Poultry Science Congress an International Exhibition is also being organised to be part of the Congress.

The International Poultry Exhibition will be a unique event highlighting the poultry sector in India and its vast potential. India is today one of the largest markets in the world with an urban middle class of over 250 million.

The International Poultry Exhibition, 1996 is being organised by WORLD'S POULTRY SCIENCE ASSOCIATION (India Branch), Pune, in collaboration with TAFCON PROJECTS (INDIA) PVT. LTD., New Delhi.

Some of the companies who have booked stalls are :

Cobb, Elanco, Pfizer, Choretime, Food Engg. Services, Tri-Bio, KPL Inc. Arbor Acre, Solvay, Vineland, Preserve Int. Moem, Idexx, Maja, Diamond Automation, Staalkat, Welgrow, Lubing, Moba, Euroemme, Du-Coa, Alltech from U.S.A., Val, Meyn, Stork, Intervet, Van de Glind from Netherlands, Big Dutchmann, Lohmann, from Germany, Roxell, Petersine from Belgium, Ovotec from Denmark, Jamesway from Canada, Rhone Poulenc, Isa from France, Roche, Sandoz from Switzerland, Kyowa from Japan, Babolna KFT from Hungary, ABIC from Israel. Indian companies like VHL, Kasila, C&M, IPF, MERIND, DEEJAY, NECC etc. have also confirmed their participation and booked appropriate space.

For booking/information, contact :

Exhibition Secretariat : Tafcon Projects (India) Pvt. Ltd., C-60 Nizamuddin (East), New Delhi - 110013, India. Tel : 91-11-4633881/ 4633889, Fax : 91-11-4635215.

FINE FOOD '96

**Venue : Melbourne, Australia
Date : September 8-11, 96**

Australia is a major importer of food products, imports having crossed A \$ 2 billion. Its major imports include fish and fish products, vegetables and fruits, coffee, tea, cocoa

and spices, alcoholic beverages etc.

Fine Food attracts over 21,000 trade visitors from all over Australia and about 40 overseas nations. Over 70 percent of the visitors during 1995 edition, were directly involved in purchasing.

Exhibit Profile :

Foods & Drinks

- Additives • Baby Foods • Bakery Products • Beer • Biscuits • Cashew • Cereals • Rice • Chocolates • Chutney • Coffee • Condiments • Confectionery • Dehydrated Foods • Dietary Foods • Flavourings • Fruits & Vegetables • Garlic • Ginger • Health Foods • Honey • Liquors • Meat • Nuts • Oils & Fats • Pastas/Spreads • Pickles/Jam • Sauces / Ketchup • Sea Food • Seasonings • Spices • Spirits • Squashes • Tea • Water (Mineral) etc.

Equipment/ Services :

- Bakery Equipment • Bar Accessories • Ceramics • Cash systems • Clothing • Crockery • Display Equipment • Furniture • Glassware • Kitchenware • Refrigeration Equipment • Tableware etc.

Miscellaneous :

- Carpets • Furnishings • Floor Coverings • Bed Linen • Table Linen • Curtains & Accessories etc.

For information, contact :

Worldwide Exchange, Post Box : 3564, E-186, Basement-5, Lajpat Nagar-1, New Delhi-110024, India. Tel : 0091-11-684 8281(R) 0091-11-877 0515. Fax : 0091-11-684 8281 (R) 0091-11-877 1625.

FOOD & BAKE '97

**Venue: Birmingham, England
Date : September 28-October 1, 1997**

The major exhibition for the bakery and fast food industries in the UK, will be Food & Bake '97 to be held at Birmingham's National Exhibition Centre.

Held since 1989, the exhibition is the most important event for the bakery market in the UK and in 1995 attracted 11,458 visitors, including craft bakers, industrial bakers, confectioners, multiple food retailers and food manufacturers.

New for 1997 is a development into the convenience and fast food markets, with separate areas devoted to fast foods, sandwiches, snack and pizza and pasta meals.

For further information contact:

Chris Reynolds, Turret Group Plc, Tel : +44 1923 228577 or Fax : +44 1923 221346.

PRODUCT REVIEWS

MATERIAL HANDLING EQUIPMENTS

Waghela Brothers are one of the leading manufacturers and suppliers for bulk material handling equipments and systems and spares all over India.

These equipment give more versatility, more accuracy and are easier in maintainance for higher profit at a very competitive price. Bulk handling equipments are: All types of - Screw conveyors, Bucket elevators, Roller conveyors & rolling equipments, Rotary feeders, Belt conveyors, Loose screw flights, Loose buckets and other such equipments. The size ranges from 25 mm dia x 25 mm pitch upto 2000 mm dia x 2000 mm pitch (1 mm to 25 mm thk in M.S. & S.S.)

They also provide valuable assistance on all your problems involving material handling systems.

For details & requirements, contact:

Waghela Brothers

Gala No. 1, Oswal Compound,
Behind Trimuph Ind. Estate, Pandit Nehru Road,
Mulund Link Road, Near W.E. Highway, Ett Bhatti,
Goregaon (East), Bombay 400 063.
Phone : 8744131, 8746502.
Fax: 91-022-8746502

CAST IRON VALVES

'Davite' manufacturer Cast Iron Diaphragm, Gate, Globe, Angle Butterfly, Non Return, Safety, Plug Valves, Ball Valve in various sizes and Flange specification. Sizes are up to 1200 mm and Valves are offered in various standard such as BS, ASA, DIN etc. Valves are offered in different working parts, method of operation and pressure rating.

For details & requirements, contact:

The Davite Company

29, Waterloo Street,
Calcutta 700 069.
Ph. : 033-2482450 / 4634
Fax: 033-2484634 / 1058

INSECTOCUTORS

"Pest-O-Kill" from Opel Industries is designed to attract, electrocute and collect all flying insects such as flies, mosquitoes, etc. While its use is harmless to humans, the insectocutor keeps insects away from homes as well as industries such as food, beverage, pharmaceuticals and is a must also for hotels, canteens, restaurants, dairies, hospitals, etc.

For your requirements, contact

Opel Industries

235-A, Adhyaru Indl. Estate.

Sun Mill Compound, Lower Parel,
Mumbai-400 013

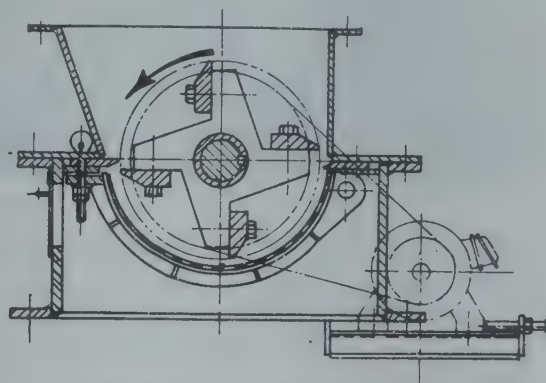
Tel : 492 4123 / 492 6884

Fax : (022) 492 6884.

COCONUT SHELL CRUSHER

With increasing cost and poor quality of Indian coal boiler users are looking for alternative fuel. Indiana has developed a crusher which can crush coconut shells to required size for using in fluidised bed boilers.

Indiana has already supplied this type of crusher to one of their customers and the same is in satisfactory operation. This crusher can be supplied for -6 mm to -25 mm product size and upto 20 TPH capacity.



COCONUT SHELL CRUSHER

For details & requirements, contact:

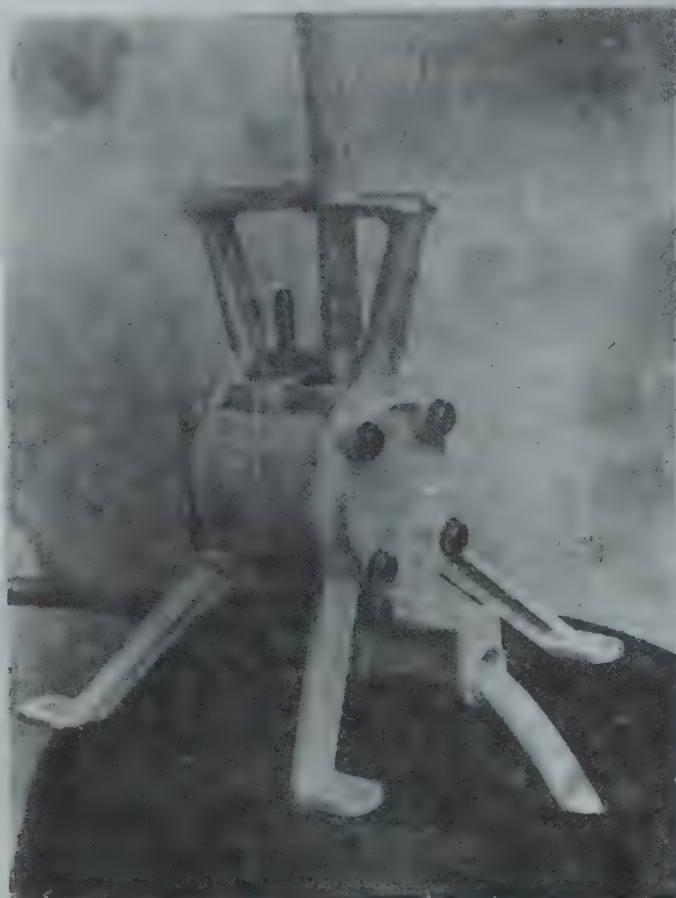
Indiana Conveyors Pvt. Ltd.

Indiana House, P.Box No. 7409,
Marol Naka, Andheri (E),
Bombay 400 059.
Tel: 8344743 / 8340402
Fax: 8367154

BARREL PUMP IN TEFLON

An air operated pump with all wetted parts in PTFE, has been introduced for the first time in India. It can handle all chemicals, solvents, oils, corrosives, inflammables and hazardous chemicals of low viscosity. It is air operated so is safe for explosive areas. It is a diaphragm type pump with only one moving part, so there is no leakage and is maintainance free. The diaphragm is in PTFE, is stress-free, and pressure-balanced in operation. So diaphragm life is very long compared to traditional diaphragm pumps. It is self-priming and can run dry indefinitely. It has a capacity of 3 to 5 lpm and offers heads to upto 20 meters. It weighs only 3 kg, is easily portable and requires no foundation. It is ideally suitable for applications in barrel unloading & direct high head transfer, dosing, circulation, siphoning, filtration etc. of all low viscosity fluids. It is available in low cost

polypropylene also. It operates on 1 HP compressor / on plant air of 3 - 10 bars. It is a highly versatile pump which finds applications wherever chemicals are handled in small to medium quantities.



For your requirements, contact:

Chemineers

127 - J.P. Towers, Tagore Road,
Rajkot - 360 002.
Gujarat State
Fax : 0281 - 24455.

MASALA POWDERS

Amruth Food Products manufacture good quality masala powders using ingredients which are very essential for maintaining good health. For example, curry leaves are known to maintain health condition of the heart. Other products are Instant Mixes, Convenience foods, Processed food.

For your requirements, contact:

Amruth Food Products

No. 234, Vijeyandra, D.I.C. Rd.,
Hebbal Indl. Area, Hootgalli,
Mysore, Karnataka
Tel/Fax: 0821-26990.

CONSULTANCY/DISTRIBUTION

Indian Food & Beverages market is a complex market where it is easy to get confused and make mistakes.

Hindustan Snacks Ltd. offers its services in the fields of distribution and retail market servicing, database services, market consultancy and as international intermediary. For distribu-

tion, retail market and database services, the company confines to the markets of M.P., Maharashtra and Goa. The Company has a computerised database of about 50,000 retailers which can be used to generate sharply focused mailing lists at a short notice.

Hindustan Snacks has a holistic approach to food marketing. This combined with global vision, deep understanding of the Indian ethos and hands-on experience of day-to-day marketing enables it to analyse food markets in a unique manner.

Strategic Planning, Brand Management, Market Studies, Retail market audits, Match Making - Collaborations & Partnerships, as well as professional assistance for commodity trading are some of the services offered by Hindustan Snacks to Indian and international companies.

Hindustan Snacks Ltd claims to strive to establish long term ethical relationships.

For your requirements, contact:

Mr. Anil Chawla, Managing Director

Hindustan Snacks Limited

1/8, Ranthambhor Complex,
Zone 11, M.P. Nagar,
Bhopal - 462 011 (MP)
Tel: ++ - 91-755-556476 / 576476
Fax: ++ - 91-755-576319

SHRINK/STRETCH WRAPPING

Shrink wrapping and stretch wrapping is an innovation in packaging line which provides water, pilfer proof, see-through economical packaging and can be applied to any product. This type of packing uses polyethelene which have qualities of shrinking or stretch as the case may be. This type of packing compacts the product, and eliminates master or medium cartons. Some of the application areas are:

Pharmaceuticals, cosmetics, glass, paper and allied products even currency notes, food products in cans, bottles, tetrapack, frozen meat, tins, vanaspati or ghee containers, baby food, beer bottles and cans.

For your requirements, contact:

Compac Systems

E-211, Flatted Factories Complex,
Okhla - III, New Delhi 110 020
Ph: 683 1545, 691 4065. Fax: 684 1307.

SOFT DRINK

Thums Up, India's No. 1 carbonated soft drink, on April 2 unveiled the marketing strategy behind its new positioning line 'I Want My Thunder', and the use of adventure sports as a communication route to building a more contemporary, thrilling and exciting image with its core target consumers. The new positioning line will be further reinforced with stunning new Can and PET packages that are to be launched shortly - both of which will be 'firsts' for Thums Up.

The 50-second television commercial features an accomplished championship diver - Nakul Kapoor, representing a die-hard Thumps Up drinker on being denied his favourite Thums Up and seeing an oncoming Thums Up truck in the distance,



LAKH ENTERPRISES

182, YUSUF MAHERALI ROAD
1ST FLOOR, BOMBAY - 400 003
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BOMBAY - 400 027 (INDIA)
PHONES : SHOP : 3077388, 3089781
FAX : +91-22-3089781

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- * Tomato Ketchup, Tomato Puree
- * Strawberry Bar, Strawberry Crush; Canned Strawberry Pulp (natural) Sulphited Strawberry Pulp
- * Red Chilli Sauce, Green Chilli Sauce
- * Orange Oil, Orange Juice Sulphited, Orange Squash, Orange Bar

For your requirements :

Contact Office :-

M.I.D.C. Plot No. B-8
Islampur -415409
Dist. Sangli (M.S.)
Tel.: (02342) 22343, 22348
Fax.: (02342) 23064

Head Office :-

Aditi Udyog Bhavan
S.T. Stand Road, Islampur
Dist. Sangli (Maharashtra)
Tel : (02342) 22884, 22849, 22240
Fax : (02342) 23064

Factory :-

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Mulund [West]
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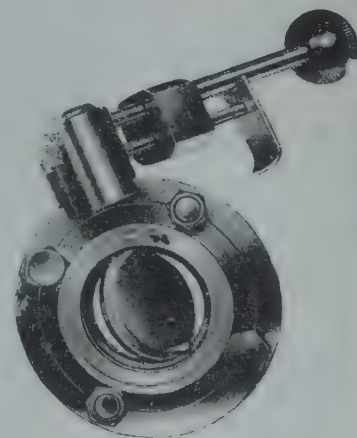
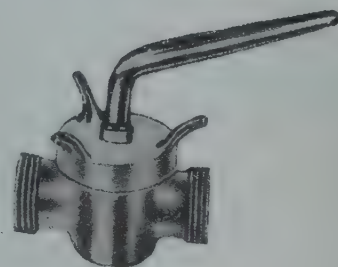
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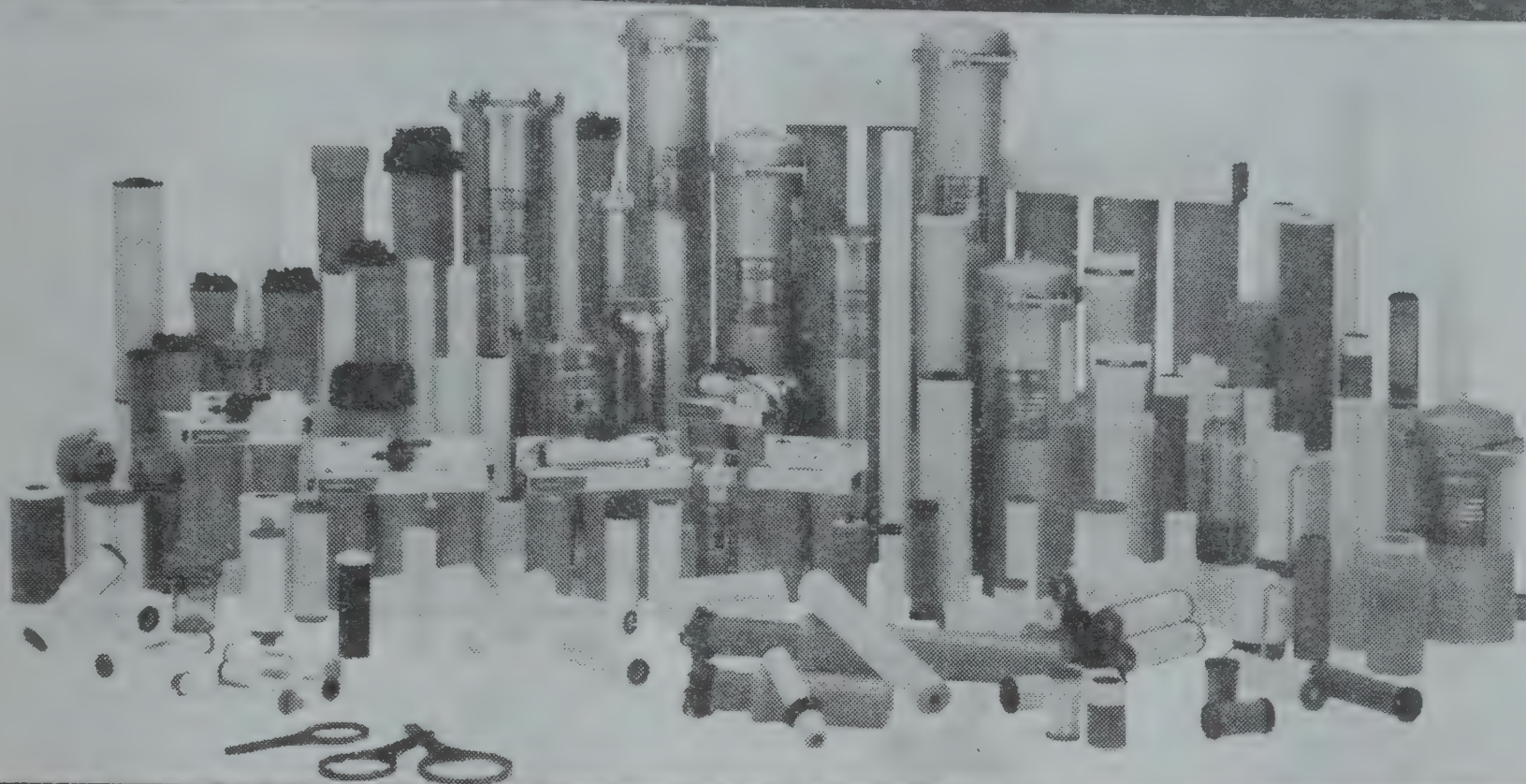
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KAY AAR Compound, J.B. Nagar
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Yes! We are interested in the Ametek Filtration Cartridges/housings for _____ industry. Approximate requirement _____ cartridges per annum.

Required Micron Rating _____

Please tick ☐ Send your representative for discussion. ☐ Send me more details.

Name _____

Address _____

Tel/Fax _____

(Attach Business Card)

FBW

takes a breathtaking Bungee Jump from a specially manufactured steel cage suspended over a valley at a height of 4000 feet above sea level to grab the drink of his choice - a Thums Up bottle from atop the passing delivery truck.

The Thums Up Bungee Jump, the first of its kind in India, was organised specially for the television shoot by A.J. Hackett & Co. of New Zealand, known the world over for their perfect record in executing successful jumps including ones from the Eiffel Tower and the Empire State Building. The commercial was shot at four locations outside Mumbai, Panchgani, Khandala, Mahableshwar and Pratapgadh.

Thrill, excitement and winning have traditionally been very strong positive brand characteristics for Thums Up. Adventure sports as a communication vehicle has not been exploited significantly in India and offers huge opportunities to craft a sharper cutting edge and more contemporary 'ahead-of-the-trend' image for Thums Up

The Coca-Cola Company is the world's largest beverage company and the leading producer and marketer of soft drinks. Along with Coca-Cola, recognised as the world's best known brand, the Company markets four of the world's top five brands including Diet Coke, Fanta and Sprite. Through the world's largest distribution system, consumers in nearly 200 countries enjoy the Company's products at a rate of more than 800 million servings per day.

For your requirements, contact:

Coca Cola India
External Affairs Department
World Trade Centre 1, CO Floor, Cuffee Parade
Bombay 400 005, India
Phone : 91-22-218 9885
Fax : 91-22-218 9882
Telex : 011-84373 COKE IN.

THE CREATIVE BAKER

The "MultiDrop" from "Polin" Italy - is the most sophisticated and innovative Depositing Machine - through the movement of three computer aligned axes, the operator can create many Imaginative New Shapes of Biscuits / Cookies.

Accurate reproduction of craftman's manual movement to achieve consistent results * Managed by a computer, capable of optimizing Productivity & Quality * The choice of shape and size for the products and the adjustment of controls are managed by a microprocessor with 99 programmes * The Machine is extremely compact and is equipped with rotating castors to allow for easy movement * Fabricated completely in stainless Steel to allow easy cleaning * Wirecut attachment is also possible.

For further details, Contact:

Indian Foods (P) Ltd.
Marketing Office,
"Bakery & Food Industry Service Division"
171, K.K. Nagar,
Madurai - 625 020.
Tel: 0425-42776. Fax: 0425-41511.

MAIZE (CORN) STARCH

The Anil Starch Products Ltd., a pioneer in the manufacture

of maize (corn) starch, has recently introduced a modified starch, CANDYNIL, for the manufacture of starch candy. The use of CANDYNIL, for the manufacture of starch candy. The use of CANDYNIL has several advantages over the use of gelatin or pectin as jelling agents. Besides being cheaper to use (after discounting that one has to use higher concentrations) starch confections have a mouth-feel which many prefer. Unlike gelatin, starch is of vegetable origin. CANDYNIL can also be used in combinations with gelatin or other hydrocolloids.

For additional information, please contact:

The Anil Starch Products Ltd.
Anil Road, P.B. No. 10009,
Ahmedabad 380 025.
Tel: 212 3222
Telex: 121-6544 NILA IN
Fax: 211 0731
E.Mail : Gen.AHD@ANIL.SPRINT RPG.SPRINT.COM

FLYING INSECT CONTROL SYSTEM

PEST-O-FLASH, the flying insect control system made by Pest Control (India) Ltd. is widely used throughout the country in hotels, restaurants, canteens, dairies, bottling plants, pharmaceuticals companies, bakeries, food processing and canning industry, fisheries, abattoirs, wherever flying insect control is important.

The High-line ceiling model (HLC) shown below has 2 Tubes of 24" and is a sleek, rugged, handworking industrial model ideally mounted on wall or ceiling.

The Pest-o-Flash systems kill flies and other insects conveniently and hygienically, and continuously without interrupting production. The systems are low-priced and noiseless and there are no fumes, chemicals or odours.



For further details, contact:

Pest Control (India)
Marketing Division
127, Keytuo Ind. Estate,
220, Kondivita Road,
Andheri (E),
Bombay 400 059.
Tel: 821 7385, 821 3546, 821 3547
Fax: 822 1647.

FINE CHEMICALS

S.A. Chemicals with a global vision in mind has been surging ahead at an impressive speed to service the ever increasing needs of its customers. Qualified promoters, professional marketing team, emphasis on quality, effective after sales service, timely and prompt dispatches and cost effectiveness are the company's trademarks.

Sorbitol, available in abundance from fruit like Black Grapes, apples, plums, cherries, pears, find application in Foods and Beverages such as Candies, Drinks, Cereals & Snacks etc. as well as cosmetics, textiles, synthesis of rigid polyurethane foams.

Dextrose, a monosacharide sugar finds application in food and beverages like jams, jellies, icecream, chewing gums, meat, beer, etc.

Liquid Glucose known as Glucose or Corn Syrup finds application in Confectionery, Bakery products, Ice Creams, etc.

Malto Dextrin (Spray dried), used in infant food/feed supplements, beverages, bakery and snack foods, dairy, confectionery, dry mixes, sauces and salads, is a spray dried product.

Other corn based products and modified starches are: Refined Corn Oil, Maize gluten, Corn Steep Liquor, Dextrin, Oxidized Starch, Starch Ester.

Besides the above, S.A. Chemicals supply Casein, Folic Acid, Sodium Hydrosulphite, Calcium Carbonate, Lactose, Ascorbyl Palmitate, Calcium Gluconate.

For your requirements, contact:

S.A. Chemicals,
4/33 Malad Co-op. Hsg. Soc. Ltd.,
Poddar Park, Malad (E)
Bombay 400 097
Tel: 8414872, 840 9023
Fax: 91-022-8405347

EPE ACTIVATED CARBON FILTERS

EpE systems has been solving unique and demanding needs for filtering systems which effectively trap odors, pollutants and particulates for the past few years. EpE activated carbon filters are one of the Industry's most versatile and efficient products available.

EpE Systems distributes and markets activated carbon products for a variety of uses in India. The high quality activated carbon used in EpE is one of the most naturally porous structures known - one cubic foot provides approximately 200 million square feet of surface area! This gives the filter tremendous adsorptive capacity and allows it to function as an extremely efficient net which snares and traps odors and impurities within its vast network of microscopic channels.

Using a high quality activated carbon is only half of the solution. To have a product that completely meets your demands requires the ability to manufacture and supply in many different forms offering minimal resistance to airflow.

EpE activated carbon filters use a durable non - woven polyester or open-cell foam base. This combination of high

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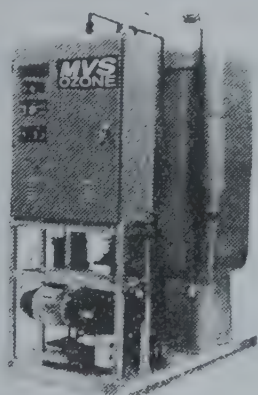
Indrayani Foods Limited
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Pune-411 001

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Ozone (O₃) is a triatomic form of Oxygen, formed by the recombination of highly excited Oxygen atoms with other stable Oxygen molecules. The Ozone Generator consists of Ozone Cell, High Voltage/Frequency systems, Air/Oxygen feeding & Controlling set up. Ozone is generated by passing dry air or Oxygen through a high voltage corona discharge between the two concentric electrodes of Ozone cell. Ozone concentrations upto 1.5% on air feed and 3 to 5% on Oxygen feed can be achieved. Ozone is highly unstable and thus it must be generated on site.

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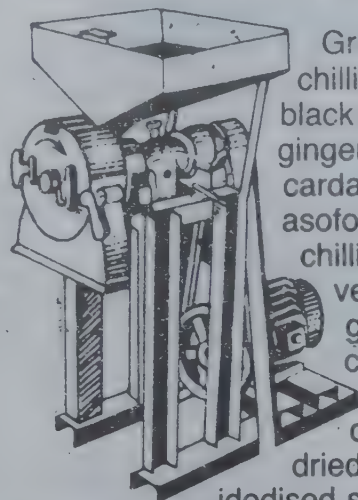
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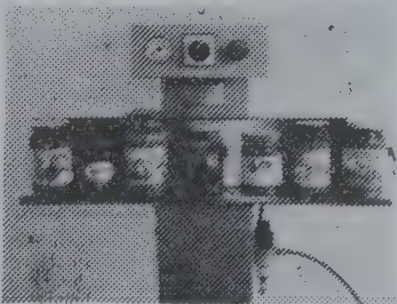
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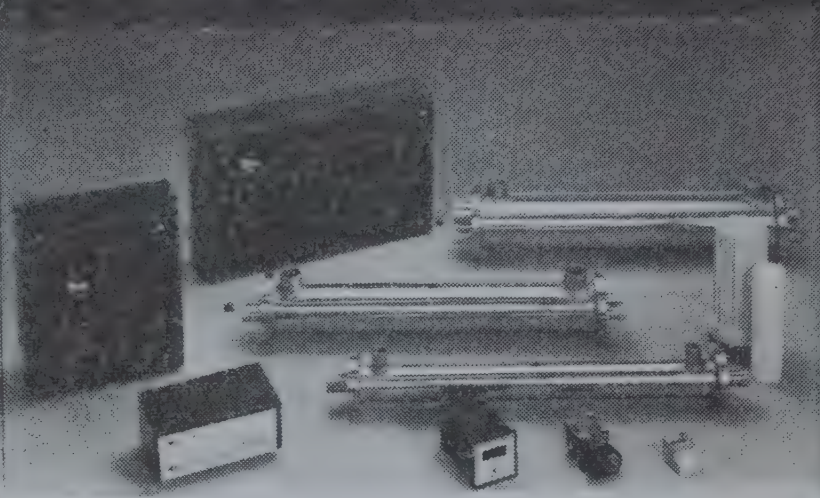


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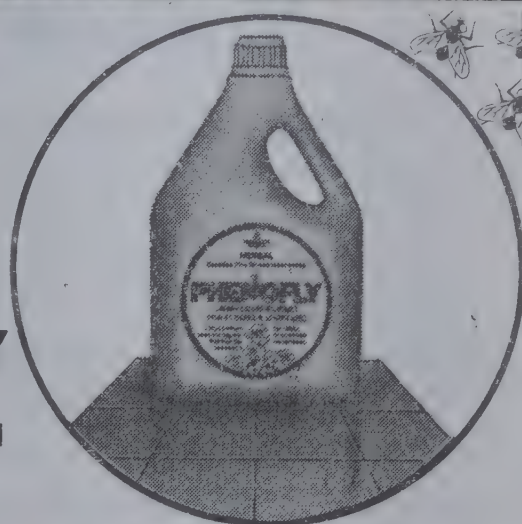
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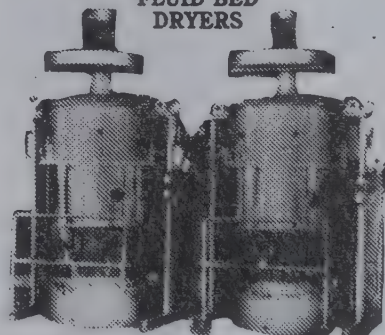
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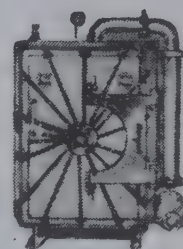
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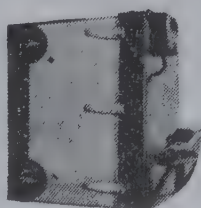
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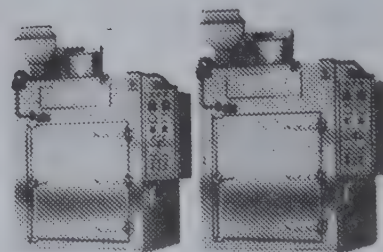
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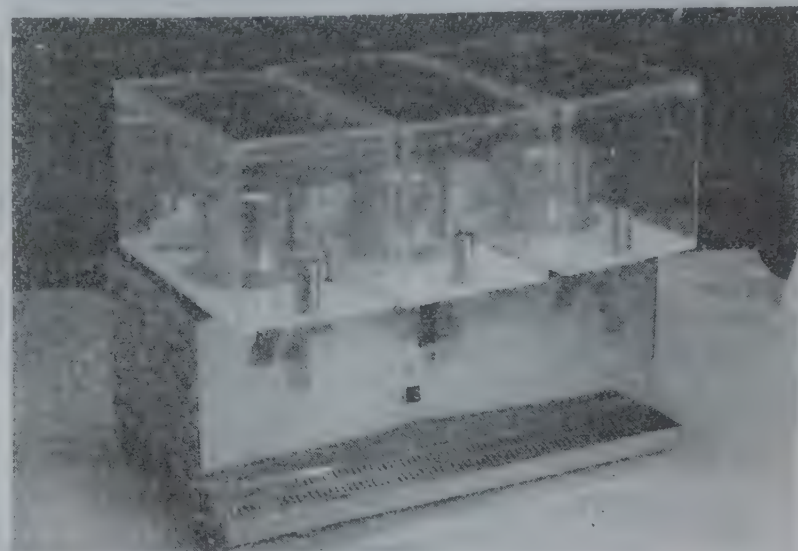
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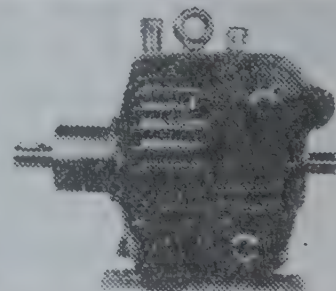
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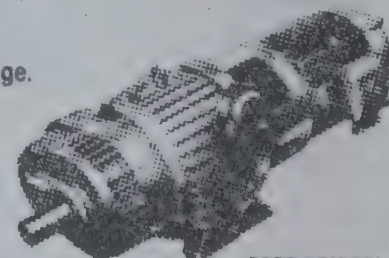
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Sesu Trading Corporation, 4th Flr., Sai Chambers, 367/369, Narsi Natha St., Bombay 400 009. Tel: 3414444 / 3426402. Telex: 11-72247, Fax: 11-3420832.

Star Chemicals (Bombay Ltd.), 55/58, Jolly Maker Chambers No. 2, Nariman Point, Bombay 400 021. Tel: 2028029/2028728/2870165, Fax: 2027980.

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Burzin & Leons Agenturen Pvt. Ltd., Readymoney Bldg. No. 1, Sir Ratan Tata Marg, Tardeo Rd., Bombay 400 034, Tel: 4944616, 4921255. Fax: 4930283.

Ganesh Benzoplast Ltd., Ganesh House, Marol, Andheri (E), Bombay 400 059. Tel: (91) (22) 8382096/8383097/8384548. Tlx: (081) 011-79164/83906 GIN IN. Fax: (91) (22) 2068475/8391529.

Kiran Kotak & Co. -- See under "Gelatine"

Manish Chemicals, 106

Bhandari St., Maskai Bldg., 2nd Fl., R.No. 24, Mumbai 400 003. Tel: 3400296/3411302

Olin Chemicals -- See under "Acetic Acid".

Roha Dyechem Pvt Ltd. -- See under "Food Colours".

Sesu Trading Corporation -- See under "Acids".

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Food Tech Engineers-- See under "Machinery, Food & Beverage Processing."

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Mamko Process Equipments -- See under "Emulsifiers".

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Industrial Refrigeration -- See under "IQF Spiral Freezer"

Saffaire India, 51, Juhu Supreme Shopping Centre, Gulmohar Cross Rd., No. 8, J.V.P.D. Scheme, Bombay 400 049. Tel: 6203998. Cable: SAFRIGE

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Pest Control (I) Ltd., 127, Keytuo Estate, 220, Kondivita Lane, Andheri, Bombay 400 059. Tel: 8213546, Fax: 8221647.

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Sakav Enterprises, 12/82, Govind Nagar, Sodawala Lane, Borivali (West), Bombay 400 092. Tel: 8010250.

AIR/DUST/FUME CONTROL

Donromos Private Ltd. -- See under "Airconditioning/Refrigeration Plant/Equipment".

Rathi Industrial Equipment Co. Ltd. -- See under "Size Reduction Equipment".

Thor Systems (A Div. of Surger Exim Inc.) 206 Bakehouse, Maharashtra Chamber of Commerce Lane, Kalagodha, Bombay 400 023. Tel : 2846222, Fax : 2057448.

AJINOMOTO

Ace International -- See under "Guar Gum".

Kiran Kotak & Co. -- See under "Gelatine".

Lakh Enterprises -- See under "Agar Agar (Powder/Strips)".

Sesu Trading Corporation -- See under "Acids".

ALGINATES

Burzin & Leons Agenturen Pvt. Ltd. -- See under "Additives, Food & Beverage".

ANTI-CORROSION CHEMICALS

Manikant Brothers, 311, New Anant Bhuvan, 257/65 Narsi Natha St., Bombay 400 009. Tel: 375 2881/375 6977. Telex: Care-011-74491 TEXOIN. Fax: Care 91-22-3750388.

ANTI-POLLUTION SYSTEMS

Pest Control (I) Ltd. -- See under "Air Curtains".

Thor Systems -- See under "Air/Dust/Fume Control".

ANTI-OXIDANTS

Camlin Ltd. (Pharma & Fine Chemicals Div.), Camlin House, J. B. Nagar, Andheri (East), Bombay 400 059. Tel: 8366635. Fax: (91) 22-8366579.

Olin Chemicals -- See under "Acetic Acid".

Panorama Industries, W-24, MIDC, Phase II, Shivaji Udyog Nagar, Dombivli 421 204. Tel : 470

486, 473333. Fax : 470031.

Quality Industries, W-50, MIDC, Phase II, Manpada Road, Dombivli 421 204 (E). Tel : 470431/473333. Fax : 470031.

Sesu Trading Corporation -- See under "Acids".

Vini-Chem Laboratories, 5, Girdhari Bhavan, 48, A/B Sadashiv Cross Lane, Bombay 400 004. Tel: 358578. Gr: FORMALIN

AROMATIC CHEMICALS

Dewang Corporation, S-3 Navrang, Swastik Char Rasta, Navrangpura, Ahmedabad 380 009. Tel : (91-79) 656 8012, 380009. Tel: (91-79) 6568012, 464019. Fax : (91-79) 442 199, 462009.

L. B. Aroma & Chemicals, 4, Omex Chambers, Gr. Fl., Telli Galli Rd., Andheri (East), Bombay 400 069. Tel: 8326277. Fax: 6107700.

Sesu Trading Corporation -- See under "Acids".

Sonarome Chemicals Pvt. Ltd., No. C-136, Peenya Indl. Area, Peenya 2nd Stage, Bangalore 560 058. Tel: 8394804/8395595. Fax: 3334802/2200016. Tlx: 845-8848.

AUTOCLAVES

Fabdecon Engineers -- See under "Agitators".

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing".

M. F. Marketing Pvt. Ltd., B-15, Arjun Centre, B.S. Devshi Marg, Govandi, Bombay 400 088. Tel: 5557515/5560947. Fax: 01-22-5560569.

Machinfabrik -- See under "Coolers, Vacuum, Batch".

Techno Equipments -- See under "Food Processing Equipment/Plant".

Thor Systems -- See under "Air/Dust/Fume Control".

AUTOMATIC FORM-FILL-SEAL MACHINES

Unique Flexo Packaging, Gala No. B-270, Joshiwadi, Off Manpada Road, Opp. Kasturi Plaza, Dombivli (E), 421 201. Tel: 5785723/711-462272.

BAGGING & WEIGHING MACHINES

Bombay Engineering Industries -- See under "Filling Machines, Powder/Granules".

BAKERY/BISCUIT EQUIPMENT

Admir Engineers, Plot No. 1/ E-4 Shivaji Nagar, Govandi, Bombay 400 043. Tel: 5511718/5568446. Fax: 91-22-5568446.

Advance Equipment Co. -- See under "Airconditioning/Refrigeration Plant & Equipment".

Aifso Enterprises -- See under "Ovens, Bread/Biscuit Baking".

Continental Equipment India Pvt. Ltd., 1E/1 Jhandewalan Extension, Link Rd., New Delhi 110 055. Tel: 521282 & 7524767. Cable : Efficient. Tlx: 031-66706 CANT IN. Fax: 011-7524767.

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

Grovers Private Limited, 4-F4, Shankardham, Sundervan Complex, Off Lokhandwala Complex Rd., Andheri (W), Bombay 400 058. Tel: 6293092. Fax: 6293014.

Indian Foods Private Ltd., 171, K.K. Nagar, Madurai - 625020. Tel: (0452) 42776. Fax: 91-425-41511.

J.M.B. Engineering, Shop No. 2, Shed No. 3, Kondivitta Road, Behind Diamond Restaurant, Andheri (E), Bombay 400 059. Tel: 8363113/8380538.

Sakav Enterprises -- See under "Air Dryers".

Sarlech Enterprises (India), 14462/1 Bhagwan Nagar, Near Savitri Complex, G.T. Rd., Ludhiana 141003. Tel: 531444, Gr : SARLE-HEAT, Tlx : 0386-384 PSIC - IN - ATTN. Fax: (091-161) 532 871.

BAKING POWDER

Lakh Enterprises -- See under "Agar Agar (Powder/Strips)".

BALANCES, ELECTRONIC

Lab Instruments, 78(B) Jaganath Sankar Seth Rd., "Ratnadeep", (Near Roxy Cinema) Opera House, Bombay 400 004. Tel: 3610973. Fax: 3680440

BARRELS/BINS, ETC.

Aifso Enterprises -- See under "Ovens, Bread/Biscuit Making".

Ratnajeet Polycon Ltd., 2, Jawahar Nagar, S.V. Road, Goregaon (West), Bombay 400 104. Tel: 8727479/8727480, Fax: 91-22-8737071

BARREL PUMP, PTFE

Chemineers, 127 J.P. Towers,

Tagore Rd., Rajkot 360 002, Gujarat State. Fax: 0281-24455.

BARRIER BAGS

W.R. Grace & Co. (India) Pvt. Ltd. -- See under "Packaging Materials".

BATCHING & CODING SYSTEMS

Acme Scales Company, 342-C Grant Rd., Nr. Super Cinema, Bombay 400 007. Tel: 3081198, Gr: ACMESCALES.

Codex Enterprises, 601 'A' Block, 6th fl., B.G. Towers, O/S Delhi Gate, Ahmedabad 380 004.

BELTINGS

Unnati Corporation -- See under "Adhesive/Tape, PTFE, Glass".

BENZOIC ACID

Ganesh Benzoplast Ltd. -- See under "Additives, Food & Beverage".

BEVERAGE CLOUDING AGENT

Fine Organics -- See under "Emulsifiers, Food".

BEVERAGE PROCESSING MACHINERY

Goma Engineering Pvt. Ltd., Majiwada, Behind Universal Petrol Pump, Thane 400 601 (Bombay). Tel : 534 0875/1937/6436/1438/6121, Fax : 0091-22-533 3634, Tlx : C/o. 011-72389 TCWE IN A/c. No. 56.

B H A

Concorde Chemical Corporation, 205, Pinky Palace, No. 760, S.V. Road, Khar West, Bombay 400 052. Tel: 6463601/6463597. Fax: 022-646-3940.

Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corpn. -- See under "Acids".

BHATTIES, KEROSENE/ DIESEL

Liberty Industries, A-1/3 Shivaji Indl. Assoc., Vakola Bridge, Santacruz (East), Bombay 400 055. Tel: 8365774/8375887/6120301.

BISCUIT/BREAD MAKING MACHINES

Aifso Enterprises -- See under "Ovens, Bread/Biscuit Baking".

Bombay Industrial Engineers -

- See under "Machinery, Food & Beverage Processing"

BLENDERS & MIXERS

Fabdecon Engineers -- See under "Agitators".

Food Tech Engineers -- See under "Machinery Food & Beverage Processing".

Mamko Process Equipment Manufacturers -- See under "Emulsifiers".

BLISTER SEALING MACHINE

Machinecraft, 5 Navbhavna, 422 V.S. Marg, Prabhadevi, Bombay 400 025. Tel : 4221633/4226881. Fax : 4221633.

BOILERS

Bombay Industrial Engineers - See under "Machinery, Food & Beverage Processing"

Cinni Engineering Pvt. Ltd., Rainbow Indl. Estate, Behind Arvind Works, 'Vyaravali', M.I.D.C., Andheri (E), Bombay 400 093. Tel: 8328887/8300278. Gr: TECHITHERM.

Classic Enterprises, 101 Jehangir Mansion, Behind Metro Cinema, Bombay 400 020. Tel: 2088291/2058916.

Kalpna Boilers and Chemical Plants Mfg. Co., 18, Kailas Park, Chirag Nagar, L.B.S. Marg, Ghatkopar (W), Bombay 400 086. Tel: 5125352/5129796.

Santosh Engineering & Fabricators, 97 Nahar & Seth Indl. Estate, 4th Fl., Pannalal Silk Mills Compound., L.B.S. Marg, Bhandup (W), Bombay 400 078. Tel: 5612746.

BOILER FEED PUMPS

Raj Pumps, P.O.Box 90, M.I. Rd., Jaipur 302 001. Tel: 372308/372949.

BOPP FILM

Petrox Private Ltd., Near Indian Oil Installation, Wadala East, Bombay 400 037. Tel: 4122667/4122696/4132704. Tlx : 11-76080 PG IN. Fax: (91-22) 4147544.

BOPP PACKING TAPES

Acme Packaging, 10, Topiwala Mansion, 1st Fl., Above Patel Restaurant, 93/97 Mohamadali Road, Bombay 400 003. Tel: (Off.) 3432601 (Resi) 8725294

Bhavani & Son Pvt. Ltd., Waco House, Masrani Lane, Kurla, Bombay 400 070. Tel : 5144579/87. Fax : (22) 5110318.

BOPP/INDUSTRIAL TAPE MFG. MACHINE/PLANT

Bombay Industrial Engineers - See under "Machinery, Food & Beverage Processing".

BOTTLE CAPS & CLOSURES

Larsen & Toubro Ltd., (Packaging Div.), G-4 Bldg., Powai Works, Saki Vihar Rd., Bombay 400 072. Tel : 5781249, 5781401, 5781411. Fax : 91-022-5781358/5783437/5783927. Grams: POWAI WORKS. Tlx : 011-71693/79406.

BOTTLE FILLING & SEALING MACHINES

Autopack Machines Pvt. Ltd., 101-C Poonam Chambers, Dr. Annie Besant Road, Worli, Bombay 400 018. Tel : 4924806, 4925900, 4964926. Fax : (022) 4964926. Tlx : 11-73798

Shivsu Watek (P) Ltd. -- See under "Mineral Water Filling Machinery"

BOTTLE FILLERS

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Unique Flexo Packaging -- See under "Automatic Form-Fill-Seal Machines".

Techno Equipments -- See under "Food Processing Equipment/Plant".

BOTTLES & JARS, GLASS

A.P. Batliwalla -- See under "Crates, Plastic".

A to Z Bottle Suppliers, 81 Sheriff Devji St., (Chakla) Opp. Mohammed Haji Adam & Co., Bombay 400 003. Tel: 3415294. Fax: 3733701.

Divecha Glass Industries, 155, Maker Chambers VI, 220 Nariman Point, Bombay 400 021. Tel: 241157/241167.

R.G. Glass Agency, 244, Maulana Azad Road, (North) Opp. Urdu Times, Bombay 400 008. Tel: 3072326/3086984/3099896/3096218. Grams: SUPER-GLASS. Fax : 91-022-3010223.

Star Glass Works, 299, Kurla Andheri Road, (Jari Mari), Bombay 400 072. Tel: 5111211/5111827/8, Cables: STARBOTTLE. Fax: 011-73345 SGW IN.

BOTTLE INSPECTORS

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

J.T. Jagtiani -- See under "Machinery, Food & Beverage Processing".

BOTTLE WASHING CHEMICALS

Chemofarbe Industries, 33 New Islam Mill Compound, Mahadev Palav Marg, Near Bharat Mata Cinema, Curry Rd. (E), Bombay 400 012. Tel/Fax: 4126898, 4137674. Gr.: CHEMOPOWER Bombay 400 012.

BOTTLE WASHERS & RINSERS

Jaykay Industries, 21/2-B Vasanthpura Rd. Post, Dooda-

kalasandra, Bangalore 560 062. Tel: 648815.

Pharmaco Machines, Gr. Flr., Pandit House, Behind Nagrik Stores, Station Rd., Thane 400 601. Tel : 533 2245/536 3722. Fax : 91-22-5331084.

BOTTLING PLANTS

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Geeta Food Engineering -- See under "Food Processing Equipment/Plants."

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

Kamal Bottling Co., Plot No. 89, Ahmednagar, Indl. Estate, Co-Op. Soc. Ltd., Nagar-Pune Road, Kedgaon, Ahmednagar 414 005. Tel : 41948.

Larsen & Toubro Ltd., L & T House, Ballard Estate, Bombay 400 001. Tel : 261 8181, 261 8182. Fax : 91-22-262-0223. Tlx : 11-80020 Gr: LARSEN BRO.

Pharmaco Machines -- See under "Bottle Washers & Rinsers"

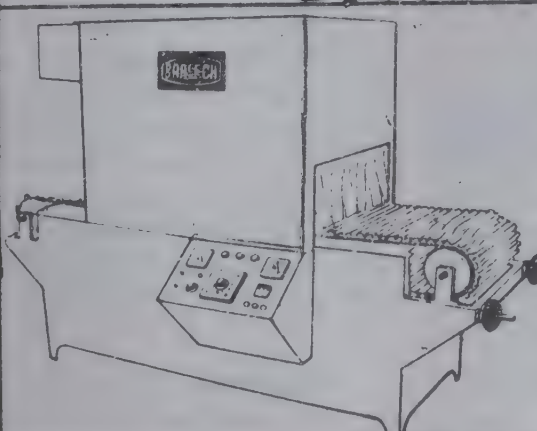
BREAD/BISCUIT PACKING MACHINERY

Samarpan Fabricators Ltd. -- See under "Filling & Sealing Machinery"

Wonderpack Industries (P) Ltd., Box No. 29127, 321 T.V. Industrial Estate, S.K. Ahire Marg, Worli, Bombay 400 025. Tel : 4949580/4934736; Fax : 91-22-4938796; 91-22-4936 496; Tlx :

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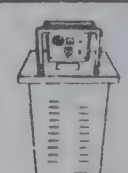

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BREAD KNEADING MACHINE

Fabdecon Engineers -- See under "Agitators".

J.M.B. Engineering -- See under "Bakery/Biscuit Equipment".

Prima Engg. Industries -- See under "Bakery/Biscuit Equipment"

BREAD QUALITY IMPROVER

Fine Organics -- See under "Emulsifiers, Food"

Kothari Fermentation and Biochem Ltd. -- See under "Yeast, Bakers"

BREAD SLICER

J.M.B. Engineering -- See under "Bakery/Biscuit Equipment".

BREWERY PLANT/EQUIPMENT

Ducon Equipments (P) Ltd.-- See under "Conveyor Systems"

Shivsu Watek (P) Ltd. -- See under "Mineral Water Filling Machinery"

Vishal Equipments, B-54, A.P.I.E., Balanagar, Hyderabad 500037. Tel : 270768/634901. Gr: VISHAL TANK

BRUSHES

Poona Brush Co., Shed No. 8, Parvati Indl. Estate, Pune 411 009. Tel : 447818/442238. Fax : 91-0212-447818.

BUCKET ELEVATORS

Waghela Bros -- See under "Conveyor Systems"

BURNERS/FITTINGS, COMMERCIAL

Globe Gas Equipments Industries Pvt. Ltd., Gala No. 139/A-2 Bldg., Shah Nahar Indl. Estate, Dhanraj Mill Compd., Lower Parel, Bombay 400 013. Tel : 4936906/4928149. Fax : 4936906. Gr: RIGHTFLAME

CAKE MIXING MACHINES

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

J.M.B. Engineering Works -- See under "Bakery/Biscuit Equipment".

CALCIUM ALGINATE

Burzin and Leons Agenturen Pvt. Ltd. -- See under "Additives, Food and Beverage"

CALCIUM CARBONATE

Citurgia Biochemicals Ltd. -- See under "Acids".

CALCIUM CITRATE

Aditi Pectins Pvt. Ltd. -- See under "Pectins"

Vidarbha Fruit Products Pvt. Ltd., B/5 Rajdarshan Basement - B, Opp. Rly. Platform No. 6, Thane West 400 602. Tel : 022-5404782

CALCIUM PROPIONATE

Fine Organics -- See under "Emulsifiers, Food".

Sesu Trading Corp. -- See under "Acids".

CAN / BOTTLE CARTONERS

Indec Equipment Pvt. Ltd., 105, Veena Indl. Estate, Opp. New Link Rd., Andheri (W), Bombay 400 053. Tel: 6267519, 6321145, 6263393. Fax: (0091) 22-6267519.

CAN CLOSING & SEAMING MACHINES

Cantech Machines, 13, Vora Bhavan, King's Circle, Matunga (C.R.), Bombay 400 019. Tel: 4096086/4096853. Fax: 91-22-4371397.

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Tinmaco Engg. Co. -- See under "Tin Can Making Machinery"

CAN FILLING MACHINERY

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Unique Flexo Packaging -- See under "Automatic Form - Fill - Seal Machines".

CAN PACKERS & SEAMERS

Cantech Machines -- See under "Can Closing & Seaming Machines".

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

CAN REFORMER / FLANGER

Tinmaco Engg. Co. -- See un-

der "Tin Can Making Machinery"

CANDY/LOLLY MAKING MACHINES

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

The Panchal Workshop, P.B. No. 62, Anand Sojitra Road, Anand 388 001. Tel: (02692) 34332, 34399. Fax: 31377.

CANDY PACKING MACHINES

New Indo International -- See under "Pillow Pack Packing Machines".

Samarpan Fabricators Ltd. -- See under "Filling & Sealing Machinery".

CANNING MACHINERY & PLANTS

Cantech Machines -- See under "Can Closing & Seaming Machines".

Ganga Singh Sukhwinder Singh Engg. Pvt. Ltd., 1 Vishal Ind. Estate, Village Rd., Bhandup (W), Bombay 400 078. Tel: 5600562/5690572. Fax: 0091-22-5649312.

Santosh Engineering & Fabricators -- See under "Boilers".

Tinmaco Engg. Co. -- See under "Tin Can Making Machinery".

CANS & CONTAINERS

Kaira Can Company Ltd., Tiecicon House, Dr. E. Moses Rd., Bombay 400 011. Tel : 496 4375 (5 lines). Fax : 4950482.

Petrox Private Ltd. -- See under "BOPP Film"

Standard Tin Works -- See under "Caps & Closures".

CAPPING EQUIPMENT

Autopack Machines Pvt. Ltd. - See under "Bottle Filling & Sealing Machines"

Frigmaires Engineers -- See under "Agitators".

CAPS & CLOSURES

A to Z Bottle Suppliers -- See under "Bottles & Jars, Glass".

Larsen & Toubro Ltd. -- See under "Bottle Caps & Closures".

Standard Tin Works, Standard House, D'Souza Compound, Safed Pool, Kurla-Andheri Rd., Bombay 400 072. Tel: 5112758/5163911/12/13, Fax: 91-22-5164851.

CARAMEL

S.A. Chemicals -- See under

"Sorbitol"

CARAMEL COLOUR

Sayaji Sethness Ltd., 17/18 GVMM, Odhav, Ahmedabad 382410. Tel : (079) 2875100. Fax : (079) 871338. Tlx : 121-6756 MAIZ IN.

Super Products Company, C-157 Naraina Indl. Area, Phase I, New Delhi 110028.

CARBONATOR

Shriyans Enterprises -- See under "Mineral Water Filling Plant".

CARBON FILTERS

EpE Systems, 294 P. Nariman St., Haroon House, Behind Reserve Bank, Bombay 400 001. Tel : 2660472, 2661998/0843/0568. Fax: 91-022-2664838

Tomco Engineering Industries, C/14 Grace Plaza, S.V. Road, Jogeshwari (W), Bombay 400 102. Tel: 6244327, 6244337. Fax: 6206702.

CARRAGEENAN

IDL Chemicals Ltd., Kukatpally, Sanathnagar, (I.E.) Hyderabad 500 018.

CARTON OVERWRAP PING / SEALING MACHINE.

Autopack Machines Pvt. Ltd. - See under "Bottle Filling & Sealing Machines"

CASEIN

Classic Casein, 178/10 Chandreshwar Bhawan, Sion Main Rd., Sion (W), Bombay 400 022. Tel : 4071318. Gr: CASEINMAN.

J. Manilal, 178/10 Sion Main Rd., Sion (W), Bombay 400 022. Tel: 4071346/4071318. Fax: 4092718.

CATERING EQUIPMENT

Varun Industries -- See under "Food Processing Equipment/Plant"

CELLULOSE PRODUCTS

Sesu Trading Corporation -- See under "Acids".

CELERY SEED OIL

L.B. Aroma & Chemicals Pvt. Ltd. -- See under "Aromatic Chemicals".

CENTRIFUGES

Filtron India -- See under "Dairy Plant & Equipment".

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Frigmaires Engineers -- See under "Agitators".

Kalpna Boilers & Chemicals Plants Mfg. Co. -- See under "Boilers".

Sharplex Agro Process (I) Pvt. Ltd. -- See under "Turnkey Plants/Projects".

CENTRIFUGAL PUMPS

Fristam Pumps (India) Pvt. Ltd., 117-A Vithalwadi Rd., Pune 411030. Tel: (212) 440068, 444079. Fax: (145) 7323 TRONIN

CHEESE MAKING MACHINES

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery".

The Panchal Workshop -- See under "Candy/Lolly Making Machine".

CHEMICALS, FINE

Balaji Dye Chem -- See under "Additives, Food & Beverage".

Fine Organics -- See under "Emulsifiers, Food".

Hindustan Chemical Industries, 77-B, Juhu Supreme Shopping Centre, Gulmohr Rd., Juhu, Bombay 400 049. Tel: 620 5464/625 1836. Gr: BASICCHEM. Fax: 91-22-6204 121.

Hitashi Chemical, 11 Ezra St., Calcutta 700 001. Tel: 2479541/2471759/2254099/2253348. Fax: 033-2479738/407173.

Piramal Healthcare Ltd., 28, Pt. M.M. Maliviya Rd., (Tardeo Rd.), Bombay 400 034. Tel: 91-22-5343508/509. Fax: 91-22-5346169

Sesu Trading Corporation -- See under "Acids".

CHEMICAL PLANT & EQUIPMENT

Adam Fabriwerk Pvt. Ltd., 203 Rajguru Apts., New Nagardas Rd., Andheri (E), Bombay 400 069. Tel: 838 0548, 838 4173. Fax: 91-22-8390195.

Cosywo Engineering Company, 15 Laxmi Co-op. Indl. Estate Ltd., Near Nagarvel Hanuman Mandir Amraiwadi Road., Ahmedabad 380 026. Tel: Fact: 2748168, 2748001. Gram: Cosywo. Fax: 079 274 8001.

Fabdecon Engineers -- See under "Agitators".

Fibre & Fibre Products -- See under "Agitators"

Frigmaires Engineers -- See under "Agitators"

Santosh Engineering & Fabricators -- See under "Boilers".

CHEWING GUM MACHINERY

Bombay Industrial Engineers -- See under "Machinery, Food & Beverage Processing"

CHILLING PLANTS

Grovers Private Ltd. -- See under "Bakery/Biscuit Equipment"

Kooling System, 35 Mannar Reddy Street, T. Nagar, Madras 600 017. Tel: 044-4342220/4348633. Gr: RITEWAYS. Fax: 044-4343577.

CHOCOLATE MAKING MACHINES

Fabdecon Engineers -- See under "Agitators"

CITRIC ACID

Ace International -- See under "Guar Gum".

Alok Chem Corporation -- See under "Guar Gum".

Balaji Dye Chem -- See under "Additives, Food & Beverage".
Citurgia Biochemicals Ltd. -- See under "Acids".

Gipsicko Laboratories (P) Ltd., 37/41, Mahalaxmi Indl. Estate, Village Iyava, Ta. Sanand, Dist. Ahmedabad 382 110. Tel: (079) 2873537, 2113772. Fax: 91-079-5838408. Gr: GIPSICO.

Kiran Kotak & Co. -- See under "Gelatine"

Sesu Trading Corporation -- See under "Acids".

CITRIC ACID/ ANHYDROUS

Amit Fine Chem. -- See under "Agar Agar (Powder/Strips)"

Olin Chemicals. -- See under "Acetic Acid".

Sesu Trading Corporation -- See under "Acids".

CITRONELLA OIL

L.B. Aroma & Chemicals Pvt. Ltd. -- See under "Aromatic Chemicals".

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See under "Distillation Columns"

Ultima Search, Excel Estate, S.V. Road, Goregaon (W), Bombay 400 062. Tel: 8722771. Fax: 22-8724172.

CLIMATE CONTROL EQUIPMENT

Donromos Private Ltd. -- See under "Airconditioning/Refrigeration Plant & Equipment"

CLING FILM

Foil Impex (Bombay) Pvt. Ltd. -- See under "Kitchen Foil"

CLOUDING AGENT

Malvin S.C. Packages Pvt. Ltd., W(67) A, Satpur Industrial Area, Nashik 422 007. Tel: 351614

COATINGS

Manikant Bros., 311, New Anant Bhavan, 256/65, Narsi Natha Street, Bombay 400 009. Tel: 376977. Fax: 3738189.

COCOA BUTTER

Sesu Trading Corp. -- See under "Acids"

COCOA POWDER

Balaji Dye Chem -- See under

"Additives, Food & Beverage"

Kiran Kotak & Co. -- See under "Gelatine"

Lakh Enterprises -- See under "Agar Agar (Powder/Strips)"

Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corporation -- See under "Acids".

COCONUT CREAM

Fresh Coconut Products Ltd., Kadupissery P.O., Trichur Dist., Kerala 680 698. Tel: 0488-867863. Fax: 0488-6304, Bombay office: Tel: 6171343. Fax: 022-6183160.

COCONUT PROCESSING PLANT

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

Sangram Engineering Pvt. Ltd. -- See under "Turnkey Plants / Projects".

CODING INK

Process Instrumentation & Con-

trols, 301, Sheth Chambers, Marimata Lane, Rajmahal Road, Baroda 390001. Tel: 452540/23661

COLD STORAGE PLANT/EQUIPMENT

General Air Conditioning Company, 16, 292 Bellasis Rd., Bombay 400 008. Tel : 3098635/3010296. Fax : 91-22-3072833.

Industrial Refrigeration -- See under "IQF Spiral Freezer"

Kooling System -- See under "Chilling Plants"

'METACOLOR', Shree Precoated Steel Ltd. -- See under "Refrigeration Equipment & Plant".

Orbit International Technologies P. Ltd. -- See under "Machinery, Potato Processing"

COLOURS, FOOD & BEVERAGE

Gujarat Essence Mart Pvt. Ltd., 124/126 Shamaldas Gandhi Marg, Princess St., Bombay 400 002. Tel : 2011449/2017214. Tlx : 011-79124 ACWB IN Attn : GEMPL. Fax : (91-22) 8380164.

Vidhi Dyestuffs Mfg. Ltd., E-27 Commerce Centre, 78 Tardeo Rd., Near A.C. Market, Mumbai 400 034. Tel: 3423512/3411369. Fax: 3427529

COMPOSITE CONTAINERS (LEAK PROOF)

Consolidated Containers (I) Ltd., 8, Anupam Indl. Est., 2, L.B.S. Marg, Mulund (W), Bombay 400 080. Tel: 5614902, 5618942. Fax: 0091-22-261-2659 (CCIL)

COMPRESSORS

Donromos Private Ltd. -- See under "Air Conditioning/Refrigeration Plant & Equipment"

CONCENTRATOR, FRUIT JUICE

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

CONCENTRATES & EXTRACTS

Aditi Pectins Pvt. Ltd. -- See under "Pectins"

BEC Foods, 31 Maker Chambers III, Nariman Pt., Bombay 400 021. Tel : +91-22-2871331/2831784. Fax : 287 3611.

Fabdecon Engineers -- See under "Agitators"

Gupta & Company Ltd. -- See under "Essential Oils"

CONDENSED MILK PLANT

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery/Plant"

CONFECTIONERY MACHINES

See also under "Machinery, Confectionery"

Eskeyar Engg. Co. (P) Ltd., 10/5 Developed Plot, Ambattur Indl. Estate, Madras 600 058. Tel: 654137/652369. Fax: 499 1447.

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

Tricon Food Machinery Co.-- See under "Food Processing Equipment/Plant".

CONSULTANCY & DESIGN

Advance Equipment Co.-- See under "Airconditioning/Refrigeration Plant & Equipment"

Dr. T.K. Food Consultants, 2A, 4th Floor, Lentin Chambers, Dalal Street, Fort, Bombay 400 023. Tel: 2657206/2651864.

Ducon Equipments Pvt. Ltd., 6 Alpana, 2nd Fl., Peddar Rd., Bombay 400 026. Tel : 388-8294/532 2395/579-0271. Fax : 0091-22-5787929.

Hindusthan Snacks Ltd., 1/8 Ranthambhor Complex, Zone 11, M.P. Nagar, Bhopal 462011. Tel: 91-755-556476. Fax: 91-755-576319.

Project & Technology Group, 1-E, JIA Sarai, IIT, Hauz Khas, New Delhi.

CONTAINERS, GLASS

Larsen & Toubro Ltd. (Packaging Div.) -- See under "Bottle Caps & Closures"

CONTAINERS, METAL

Al-Can Exports Pvt. Ltd., Shree Laxmi Woolen Mills Compd., Off Dr. E. Moses Rd., Mahalaxmi Bombay 400 011. Tel: 4921752. Fax: 2083184.

Aifso Enterprises -- See under "Ovens, Bread/Biscuit Baking"

Divecha Glass Industries (Metal Containers Div.), 249 Bal Rajeshwar Rd., Mulund (W) Bombay 400 080. Tel : (022)-5612548/5617559; Fax : (022) 5671711; Cable : GLASSUNIT; Tlx : 011-85226 GLASS IN.

Petrox Private Ltd. -- See under "BOPP Film"

CONTAINERS, PET/PLASTIC/METAL

Swastik Industries 34/C, Thakker Building, Ground Fl., Gala No. 4, Champsi Bhimji Road, Next to Shrinivas Bldg., New Post Office, Old Anjirwadi, Mazagaon, Bombay 400 010. Tel: 8729366.

Technology Plastics Ltd., No. 10 Haddows Rd., Nungambakkam, Madras - 600 006. Tel: 044-8253879. Fax: 044-834728.

CONTRA-ROTARY MIXER

Cosywo Engineering Company -- See under "Chemical Plant & Equipment"

Metal Plants, 2/17, Anupam Ind. Estate, Lal Bahadur Shastri Marg, Mulund, Bombay 400 080. Tel: 5614439/5610628.

CONTROLLERS

Flow, Liquid Level, Temp. Misc.

Industrial Instruments Co. -- See under "Temperature Indicators/Controllers"

Sakav Enterprises -- See under "Air Driers"

Tata Honeywell Limited, 55-A/8 & 9 Industrial Estate, Pune 411013. Tel: 670445, 675532. Tlx : 0145-7324 THL IN. Fax : 212-675992/672205.

CONVEYOR BELTS

Unnati Industries, 423 GIDC Tel. Exchange Lane, Odhav, Ahmedabad 382 415. Tel: 872277, 873434.

CONVEYOR SYSTEMS

Canara Engineers Pvt. Ltd., 203 Hill Green, 149 Marol Maroshi Rd., Andheri (E), Bombay 400 059. Tel : 8362704/8213849. Fax: 8362704.

Crystal Automation Pvt. Ltd. .. See under "Pneumatic Conveying Systems"

Ducon Equipments (P) Ltd. 6, Alpana, 2nd Fl., Peddar Rd., Bombay 400 026. Tel : 388-8294. Fax : 91-22-578-7929.

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing"

Indiana Conveyors Pvt. Ltd. (Pneumatic Conveying Div.) Indiana House, Off M. Vasanji Rd., Marol Naka, P.B. 7409, Andheri (E), Bombay 400 059. Tel: 8344743, 8383157. Tlx: 011-75208 IEW IN. Fax: 022-8367154.

Techno Link Conveyor Systems

Pvt. Ltd. -- See under "Screw Conveyors"

Waghela Brothers, Oswal Compound, Ett Bhathi, Pandit Nehru Rd., Near W.E. Highway, Goregaon (E), Bombay 400 063. Tel : 874 4131. Fax : 874 6502.

CONVEYOR COMPONENTS

Ducon Equipments Private Ltd -- See under "Conveyor Systems"

Superior Engineering Works, Unit No. 23B, Shukla Compd., Near Murbali Talao, Shiv Vallabh Rd., Dahisar (East), Bombay 400 068. Tel : 887 866. Fax : 887 0605.

Supertech Components, 3 Kantilal Bldg., 1st Fl., Azad Lane, S.V. Rd., Andheri (West) Bombay 400 058. Tel : 8878663/8872303. Fax : 8870605

COOKING RANGE

Vipul Engineering Equipment -- See under "Kitchen Equipment".

COOLERS, VACUUM, BATCH

Machinfabrik, B-104, Arjun Centre, B.S. Devshi Marg, Govandi, Bombay 400 088. Tel : 5555596/5560947. Tlx : 011-61002 MAFP IN. Fax : 91-22-556-0569. Gram : Steamset.

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Multifrig Marketing Co. (P) Ltd., 1/12 Kirti Nagar, (W.H.S.), New Timber Market, New Delhi 110 015. Tel : 535376, 5416277. Fax : 011-5416040.

COOLING TOWER PUMPS

Excelsior Engineers, Post Box 26764 F-18 Everard Nagar, Sion, Bombay 400 022. Tel: 4077556.

CORROSION INHIBITORS

Manikant Bros -- See under "Anti Corrosion Chemicals"

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Natraj Paper Box Factory, E-117 Ansa Industrial Estate, Saki-Vihar Road, Sakinaka, Bombay 400 072. Tel : 5786785, 5786690.

CRATES, PLASTIC

A.P. Batliwalla, 81, Sheriff devji St. (Chakla), Opp. Mohammed Haji Adam & Co., Bombay 400 003. Tel: 3415294. Fax: 3733701

CRATES, WOODEN

A.P. Batliwalla -- See under

"Crates, Plastic".

CREAM FILLING MACHINE

Autopack Machines Pvt. Ltd. -
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Food Tech Engineers-- See under "Machinery, Food & Beverage Processing"

Frigmaires Engineers -- See under "Agitators"

CREAM WAFER PLANT

New Indo International (Regd.)
- See under "Pillow Pack Packing Machine".

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Sesu Trading Corporation -- See under "Acids".

CROWN CAP PVC LINING MACHINE

Venus Packaging Services, 302 Palm Beach, Versova, Bombay 400 061. Tel: 632 1397/ 632 1398. Fax: 8113623/8110638/8110640. Fax: 6264835.

CROWN CAP PUNCHING PRESS

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing"

Venus Packaging Services -- See under "Crown Cap PVC Lining Machine".

CROWN CORKS

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Standard Tin Works -- See under "Caps & Closures".

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Hi-Media Laboratories Pvt. Ltd., 23, Vadwani Industrial Estate, L.B.S. Marg, Bombay 400 086. Tel: 5150970/5151607. Fax: 91-022-5112468. Tlx: 011-74429 HIGH IN.

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Bhap Trading Pvt. Ltd., 52 Nagdevi Street, Bombay 400 003. Tel: (022) 3424758/3447425. Tel/ Fax : 091-22-3424 758. (0265) 442435. Fax : 091-022-3424758.

Metal Craft Engineers -- See under "Valves".

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Alfa-Laval (India) Ltd., Bombay - Pune Road, Dapodi, Pune 411 012. Tel: 86321 (8 Lines) Tlx: 0146-219/259/326 ALL IN.

Chengalva Engineering Pvt. Ltd., 9 Bhagyalaxmi Nagar Colony, Gandhinagar, Hyderabad 500 380. Tel: 7612023. Tlx: 0425-6333 PCO IN. Fax : 091-40-841697.

Continental Equipment India Pvt. Ltd. -- See under "Bakery/Biscuit Equipment".

Dairy Equipment Co., 111 Wadala Udyog Bhavan, 8 Naigaum Cross Rd., Bombay 400 003. Tel: 4119127/0201. Fax: (022) 4129576.

Frigmaires Engineers -- See under "Agitators".

Filtron Engineers Ltd., 117-A, Vithalwadi Road, Pune 411 030. Tel: 091-212-440068. Fax : 091-212-477913. Tlx: 01 45-7323 TRON IN.

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing"

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery".

Kooling Systems -- See under "Chilling Plants"

'METACOLOR', Shree Precoated Steel Ltd. -- See under "Refrigeration Equipment & Plant".

Paul Air Engineers Pvt. Ltd. -- See under "Valves"

Saffaire India -- See under "Air Conditioning/Refrigeration Plant & Equipment".

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Fine Organics -- See under "Emulsifiers, Food"

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Kooling Systems -- See under "Chilling Plants"

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Food Associates Bangalore,

132, 17th Cross, 11th Main Rd., Malleswaram, Bangalore 560 055. Tel : 080-3340038/3347318. Cable: FABFOODS. Tlx: 0845-2900 PCO IN. Fax : 91-80-3347318.

Hi Media Laboratories Pvt. Ltd. -- See under "Culture Media"

DEHYDRATED VEGETABLES

Oceanic Dehydrates Pvt. Ltd. Bedeshwar, P.O. Box 2030, Jamnagar 361 002. Tel : 552777, 76814. Fax : 0288-76071.

DEHYDRATION PLANT/ EQUIPMENT

McNally Bangalore Industries Ltd., Post Box No. 28, Whitefield P.O., Bangalore 560 066. Tel: 845 2596. (8 lines) Fax : 080-845 2764; Gr: MINPROC - WHITEFIELD. Tlx : 0845-8513.

Orbit International Technologies Pvt. Ltd. -- See under "Machinery, Potato Processing"

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Aqua Filsep Inc. -- See under "Water Treatment Plants/Equipment"

Factor Engineering Co. Pvt. Ltd., A-1/104 Govardhan Nagar, Mulund (W) Mumbai 400 080.

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Komal Industries--See under "Water Treatment Plants/Equipment".

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Subtronics, Kaliandas Udyog Bhavan, Unit No. 147, Near Prabhadevi P.O. Prabhadevi, Bombay 400 025. Tel: 4224461.

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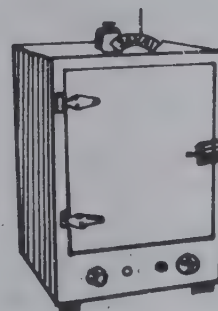
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Vipul Engineering Equipment - See under "Kitchen Equipment".

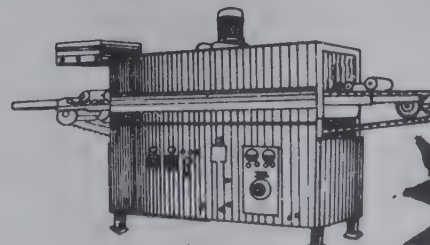


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Frigmaires Engineers -- See under "Agitators".

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General Air Conditioning Co. -- See under "Cold Storage Plants/Equipment"

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Wonderpack Industries (P) Ltd., See under "Bread/Biscuit Packing Machinery"

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DISTILLERY PLANTS

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Indian Food Fermentations Ltd., 338 Anna Salai, Nandanam, Madras 600 035. Tel: 450685. Fax: 91-44-4340304.

DOSERS

Goma Engineering Pvt. Ltd., -- See under "Beverage Processing Machinery".

Micron -- See under "Water Sterilizers".

Water Testing Services -- See under "Water Treatment Plants/Equipment".

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Elma Industries, A/15 Aaram Society, Vakola, Santacruz (E), Bombay 400 055. Tel: 6183356. Gr: MANELSI.

J.M.B. Engineering -- See under "Bakery/Biscuit Equipment".

DRYERS, OVEN/ TRAY, ETC.

Bombay Industrial Engineers-- See under "Machinery, Food & Beverage Processing".

Fabdecon Engineers -- See under "Agitators".

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing"

Kailash Scientific Co., 28 Universal Indl. Estate, I.B. Patel Rd., Goregaon (E), Bombay 400 063. Tel: 8734735, 8731836.

McNally Bangalore Industries Ltd. -- See under "Dehydration Plant/Equipment"

SSP Pvt. Ltd. -- See under "Evaporators".

Sakav Enterprises -- See under "Air Driers".

Shirke Structurals Pvt. Ltd. -- See under "Silo Storage Systems"

DUST EXTRACTORS

Thor Systems -- See under "Air/Dust/Fume Control"

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Universal Food Flavours, 133 New Apollo Indl. Estate, Mogra Village Rd., Andheri (E), Bombay 400 069. Tel: 8322631. Fax: 8378156. Gr: JEBYPATEL.

E. VANILLIN

Balaji Dye Chem -- See under "Additives, Food & Beverage".

EFFLUENT TREATMENT PLANTS

Aqua Filsep Inc. -- See under "Water Treatment Plants/Equipment"

Chemi Filter Corporation -- See under "Agitators"

Factor Engineering Co. Pvt. Ltd. -- See under "Demineralisation Plant/Equipment"

Gimret & Co., 403 Rohit House, Tolstoy Marg, New Delhi 110001. Tel: 3314422/3314499. Fax: 91-11-3314377.

Paramount Consultants, Raja Market, 1st Fl., New Nagardas Rd., Andheri (E), Bombay 400 069. Tel: 838 3864/822 3835. (Resi) 841 2775. Pager No. (9602) 107 373.

Sharplex Agro Process (I) Pvt. Ltd. -- See under "Filters"

Shesha Scienti-Chem Pvt. Ltd., 4/1 Samartha Nagar, Chunabhatti Sion, Near Chunabhatti Rly, Station, Bombay 400 022. Tel: 5330821. Gr: SOFT-DION CHUNA-BHATTI SON.

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Davar's M.P. Organics, Tansen Rd., Gwalior 474002. Tel: 23741/326888. Gram: KOLDSTORE.

Fine Organics, Food Chemicals Div., 15/2 Neelkanth Market, M.G. Road, Ghatkopar (E), Bombay 400 077. Tel: 5116900-02, 5154384, 5154380, 5154495, 5153041. Fax: 91-022-5153215. Tlx: 011-73311 FINE IN.

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Cosywo Engineering Co. -- See under "Chemical Plant & Equipment".

Frigmaires Engineers -- See under "Agitators".

Mamko Process Equipment Manufacturers, Post Box No. 19001, Bombay 400 063. Tel: 8886309/8889913. Gram: MIXIN Bombay 400 063. Fax: (91-22) 8822757.

Sesu Trading Corporation -- See under "Acids".

ENGINEERS & DESIGN- ERS, CONSULTING (See also under "Consultancy & Design")

Cosywo Engineering Company -- See under "Chemical Plant & Equipment".

Forsberg Agritech (India) Pvt. Ltd., -- See under "Grain & Cereal Cleaning/Grading Machinery".

Frigmaires Engineers -- See under "Agitators".

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

M.F. Marketing Pvt. Ltd. -- See under "Autoclaves".

ENZYMES

Biocon India Pvt. Ltd., 20th Km Hosur Rd., Hebbagodi 561 229, Bangalore Dist. Tel: 080-8422169. Gram: BLASE, Bangalore 34. Fax: 080-8422623.

Olin Chemicals -- See under "Acetic Acid".

EPOXY COATING

Manikant Brothers -- See under "Anti-Corrosion Chemicals".

ESSENCES & FLAVOURS

Bush Boake Allen (India) Ltd., 1-5, Seven Wells Street, St. Thomas Mount, Madras 600 016, Tel: 431131. Grams: ABROCOL-MADRAS. Tlx: 041 26058 BBA IN.

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Feroze Foods & Flavours, 403, Central Tin Est., F. Kondeo Marg, Sessex Road, Byculla, Bombay 400 027. Tel: 3729724/3640341.

Harish C. Khosla & Co., Zinat Mahal, Lalkuan, P.O. Box 1328, Delhi 110 006. Tel: 7524803/733160. Gr: THYMOL Tlx: 62267 HCK IN. Fax: 011-7524403

M.C. Davar Aromatics Pvt. Ltd., 266 B, J. Dadaji Marg, Hormazd Mansion III Floor, Opp. Bhatia Hospital, 266BJ, Dadajee Marg, Bombay 400 007, Tel: 3879468, 3865189. Tlx: (11) 73757 DAVR IN.

Maharashtra Essence & Gas Suppliers, 24 Sarang St., Khokha Bazar, Bombay 400 003. Tel: 91-22-342 2136/376 4252.

Red Club Flavours Pvt. Ltd., C-75, Kirti Nagar, New Delhi 110 015. Tel: 5451142, 5431556. Fax: 91-11-2913549. Gr: REDCLUB.

Sesu Trading Corporation -- See under "Acids".

Universal Food Flavours -- See under "Dusting Flavours"

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Gujarat Essence Mart Pvt. Ltd. -- See under "Colours, Food & Beverage"

Gupta & Company Ltd., XIV/294, Gali Mandi Pan, Sadar Bazar, Delhi 110006. Tel: 7774742/528923/527795. Tlx: 31-66075 GCPL-IN. Fax: 011-7519215 Cable: AROMA DELHI 110006.

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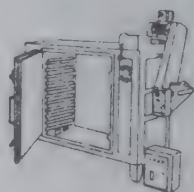


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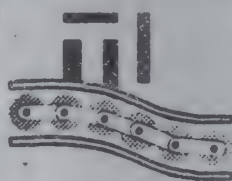


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Exporters -- See under
"Consultancy & Design".

Fabdecon Engineers -- See un-
der "Agitators".

FABRICATED EQUIPMENT

Cosywo Engineering Company
-- See under "Chemical Plant &
Equipment".

Fabdecon Engineers -- See un-
der "Agitators"

Food Tech Engineers-- See un-
der "Machinery, Food & Beverage
Processing"

Frigmaires Engineers -- See
under "Agitators"

Techno Equipment -- See un-
der "Food Processing Equipment/
Plant".

Vipul Engineering Equipment
-- See under "Kitchen Equipment".

FERMENTATION MEDIA

Warkem -- See under "Protein
Hydrosylates"

FIBRE GLASS ADHESIVE TAPE

Unnati Corporation -- See un-
der "Adhesive/Tapes, PTFE,
Glass"

FILLING MACHINES, AERATED WATER/SYRUP

Autopack Machines Pvt. Ltd. -
- See under "Bottle Filling & Seal-
ing Machines"

FILLING MACHINE, BAG/POUCH

Sellal, "Geetanjali," 9 Deccan
College Rd., Pune 411 006. Tel :
668369/610113

FILLING MACHINES, LIQUID

Bombay Engineering Industry -
- See under "Filling Machines,
Powder/Granules"

FILLING MACHINES, PASTE

Autopack Machines Pvt. Ltd. -
- See under "Bottle Filling & Seal-
ing Machines"

Bombay Engineering Industries
-- See under "Filling Machines,
Powder/Granules"

Sellal -- See under "Filling Ma-
chines, Bag/Pouch"

FILLING MACHINES, POWDER/GRANULES

Autopack Machines Pvt. Ltd. -
- See under "Bottle Filling & Seal-
ing Machines"

Bombay Engineering Industry,
Rm. No. 6 (Extn). Sevantibai
Bhavan, Chimatpada, Marol Naka,
Andheri (E), Bombay 400 059. Tel
: 8369368, 8215795. Fax : 91-22-
8327448.

Sellal -- See under "Filling Ma-
chines, Bag/Pouch"

FILLING & SEALING MACHINES

Accurate Weighing Machines
Co. -- See under "Weighing
Scales".

Acmevac Sales Pvt. Ltd. -- See
under "Bottle Washers & Rinsers".

Fabdecon Engineers -- Se un-
der "Agitators".

Food Tech Engineers-- See un-
der "Machinery, Food & Beverage
Processing"

Frigmaires Engineers -- See
under "Agitators".

Mamko Process Equipment
Manufacturers -- See under "Emul-
sifiers".

New Indo International (Regd.)
-- See under "Pillowpack Packing
Machines".

Recon Machine Tools Pvt. Ltd.,
37 Sarvodaya Indl. Estate,
Mahakali Caves Road, Andheri
(E) Bombay 400 093. Tel :
8343931. Tlx : 911-79182 RMT.
Fax : 8341074.

Samarpan Fabricators Limited,
Plot A-182/A-183, Road 16/Z,
Wagle Industrial Estate, Thane 400
604. Tel: 5321842/5320373/
5320029. Grams: PROPAC. Tlx:
011-72329 SFL IN. Fax: 91-22-
5320033.

Unique Flexo Packaging, Gala
No. B/270, Joshi Wadi, Off
Manpada Road, Dombivli (E),
Bombay 421 201. Tel: 5785723

FILLING MACHINE CONTROLLER

Preci-Tech Weighing Systems,
35 Gokul, M.G. Rd., Borivali,
Bombay 400 066.

FILM, FLEXIBLE LAMINATED

Samarpan Fabricators Ltd. --
See under "Filling & Sealing Ma-
chinery"

FILM, PLASTIC/METALLIZED

Bhavani & Son Pvt. Ltd.,
Waco House, Masrani Lane, Kurla
(W), Bombay 400 070. Tel :
5144579/87; Fax : 022-5110318

Noble Polymech Corporation -
- See under "Machinery, Packag-
ing"

Petrox Private Ltd. -- See un-
der "BOPP Film"

FILM, MULTILAYER

Rotoflex Industries Ltd., 2nd
Fl., Asarpota Chambers, C.G. Rd.,
Navrangpura, Ahmedabad 380
009. Tel: 461020, 423940, 406766.
Fax: 91-79-463444.

FILTERS

Food Tech Engineers-- See un-
der "Machinery, Food & Beverage
Processing"

Kumar Process Consultants &
Chemicals Pvt. Ltd., 230/4 Ashoka
House, 'Swastik' Behind Purnamal
Delhiwala Linking Rd., Bandra
(W), Bombay 400 050. Tel:
6432512/6420637/6451964. Tlx:
011-75973 KPCC IN. Fax : 091-
22-6432512.



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Tel: 3732078

Otoklin, Plot No. 1, Shah. Indl. Area, V. Desai Rd., Andheri (W), Bombay 400 058. Tel: 6267476.

Sharplex Agro Process (I) Pvt. Ltd., 302 Hill View, Ind. Est., LBS Marg, Ghatkhopar (W), Bombay 400 086. Tel: 5172606, 5172108, 5173808. Fax: 91-22-517 1239.

FILTERS, WATER

Hitech Ultraviolet Pvt. Ltd. -- See under "U.V. Water Disinfectant System"

FILTER CLOTH/FABRIC

Thor Systems -- See under "Air/Dust/Fume Control"

FILTER HOUSINGS/CARTRIDGES

Ace Marketing Company, 222 Shah & Nahar (A2), Lower Parel, Bombay 400 013. Tel: 4944942, 49459547. Fax: 91-22-49 54250.

FILTER PAPER

Lab Instruments -- See under "Heating Mantles".

Sharplex Agro Process (I) Pvt. Ltd. -- See under "Filters"

FILTRATION SYSTEMS

Brito-matics, C-9 Nand Dham

Indl. Estate, Marol Maroshi Rd., Marol, Andheri (E), Bombay 400 059. Tel: 8379833-8379834. Fax: 91-22-8375699.

Kumar Process Consultants & Chemicals Pvt. Ltd. -- See under "Filters".

Paramount Consultants -- See under "Effluent Treatment Plants"

Pharmaco Machines -- See under "Bottle Washers & Rinsers"

FISH PROCESSING PLANT

Industrial Refrigeration Co. Pvt. Ltd. -- See under "IQF Spiral Freezing"

Sharplex Agro Process (I) Pvt. Ltd. -- See under "Filters"

FLAKING MACHINERY, RICE

Durai Industrial Works -- See under "De-Stoners"

FLAVOURS, DUSTING

M.C. Davar Aromatics Ltd. -- See under "Essences & Flavours"

FLAVOURING EMULSIONS

M.C. Davar Aromatics Pvt. Ltd.

-- See under "Essences & Flavours".

Sri Krupa Flavours Pvt. Ltd., APHB, HIG II, Block 6, Flat 7, Bagh Lingampally, Hyderabad 500 044. Tel: 669038. Gr: SRI KRUPA.

FLAVOURING ESSENCES

Feroze Foods & Flavours, 403 Central Tin Estate, D.K. Marg, Sussex Road, Byculia, Bombay 400 027. Tel: 3729724, 3614972.

M.C. Davar Aromatics Pvt. Ltd. -- See under "Essences & Flavours".

FLOW METER

Fisher-Rosemount (India) Ltd., 26 Maker Chambers VI, 2nd Fl., Nariman Pt., Bombay 400 021. Tel: (022) 2874 758/89, 2851066, 2851774, 2851734, Tlx: 011-83757 JSGR IN, Fax: (022) - 2870502.

FLUID BED DRYERS

Flora Engineering Co. -- See under "Ovens, Industrial".

Pharmaco Machines -- See under "Bottle Washers & Rinsers"

FLUID PROCESS APPLICATION

Alweyn Pumps & Systems Pvt. Ltd., 62 Apollo Indl. Estate, Opp Mahakali Caves Rd., Andheri (E). Tel/Fax (022) 836 2688/821 4026/ Gr: Alweyn Fam Bombay 59

FLY KILLERS, ELECTRIC

Opel Industries, 235-A, Adyar Industrial Estate, Sun Mill Compound, Lower Parel, Bombay 400 013. Tel: 4924123, 4926884, 4824123, 4926884. Fax: (022) 4926884.

Pest Control (I) Ltd. -- See under "Air Curtains"

FOOD COLOURS

See also "Colours, Food & Beverage"

Ajanta Products Company, 45 West Ave., Punjabi Bagh, New Delhi 110026. Tel: 503280, 5437299. Gram: Ajanta Dyes. Fax: 011-5115171.

Gujarat Essence Mart Pvt. Ltd. -- See under "Colours, Food & Beverage"

Gujarat Foodweb Pvt. Ltd., Near Kalupukar Tower, Ahmedabad 380 001. Tel: (079) 380 225/336 595. Fax: (079) 469 109.

Hickson & Dadajee Limited, Shree Pant Bhuvan, Mamasahab Warkerkar Bridge, Bombay 400 007. Tel: 3633968/3634760 Tlx: 11-75384 EHDI IN Gram: SULF BLACK, Bombay. Fax: 91-22-3640604.

L.B. Aroma & Chemicals -- See under "Essential Oils".

Narmada Food Colours Pvt. Ltd., 56/58 Garibdas Street Vadgadi, Bombay 400 003. Tel: 3424162/63. Fax: 91-22-3432854.

Roha Dychem Pvt. Ltd., Suryoday Mill Compound, Bombay 400 034. Tel: 91-22-4945924, 4920855, 4939006. Tlx: 011-71513 ROHA IN. Fax: 91-022-4939795, 4952631.

Sesu Trading Corporation -- See under "Acids"

Vidhi Dyestuffs Mfg. Ltd. -- See under "Colours, Food & Beverage"

Vino Synth Chem Pvt. Ltd., 404 Bezzola Commercial Centre, Sion Trombay Road, Chembur Bombay 400 071. tel: 5522359/5528958. Cable: VINOBIN. Fax: 5522539.

FOOD CUTTING EQUIPMENT

Gadekar & Associates Pvt. Ltd., 304 Sector 21A, Faridabad 121001 Tel/Fax: 0129 21 0996.

FOOD FLAVOURS

Aromatik (India), No. 28/46, 3rd Cross, Kumarapark West Extn. Bangalore 560 020.

Gujarat Essence Mart Pvt. Ltd. -- See under "Colours, Food & Beverage"

Oror Flavours & Chemicals Pvt. Ltd., Subbiah Naidu Industrial Complex, Arumbanoor Post, 4 Pudupatti, Madurai North 625 107. Tel: 0452-832736. Tlx: 0445-310 SSPIN Fax: 91-452-832824. Gram: SPICES.

Universal Food Flavours -- See under "Dusting Flavours"

FOOD INGREDIENTS

Tajir Private Ltd., Adie Mansion, 334 M. Shaunkatali Rd., Bombay 400 007. Tel: 307 3314, 307 8776. Fax: 307 2757.

FOOD PROCESSING EQUIPMENT/PLANT

See also "Machinery, Food & Beverage Processing"

Bajaj Maschnine (P) Ltd., 21 Kanti Nagar, P.O. Krishan Nagar, Delhi 110 051. Tel: 2220828, 2431660. Fax: 91-11-8954995.

BEC Foods, 31 Maker Chambers III, 3rd Flr., Nariman Pt., Bombay 400 021. Tel 2043647, 2831724, 2871331, Tlx : 011-84054 BECO IN, Fax : 022-2873611.

Cantech Machines -- See under "Can Closing & Seaming Machine".

Continental Equipment India Pvt. Ltd. -- See under "Bakery/Biscuit Equipment".

Durai Industrial Works -- See under "De-Stoners".

Fabdecon Engineers -- See under "Agitators".

Filtron Engineers Ltd. -- See under "Dairy Plant & Equipment".

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing".

Geeta Food Engineering, Ashirwad Complex, Vashi Village, Behind Starling Hospital, Gala No. 2, New Bombay 400 703. Tel: 022-7667069. Fax: 91-22-7667069.

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery".

Hi-Tech Systems, 80, Hardwar Road, Dehradun 248 005. Delhi Office: C-9B, Gangotri Enclave, Alakhnanda, Kalkaji, New Delhi 110 019, H.O. 25853 D.O. : 6436772. Gr: ATMA.

Industrial Refrigeration Pvt. Ltd. -- See under "IQF Spiral Freezer".

New Indo International -- See under "Pillow Pack Packing Machines".

M.F. Marketing, B-104 Arjun Centre, B.S. Devshi Marg, Govandi 400 088. Tel : 5560947/5557515. Gr: STEAMSET. Fax : 91-22-5560569.

Metal Plants -- See under "Contra-Rotary Mixers".

'METACOLOR', Shree Precoated Steel Ltd. -- See under "Refrigeration Equipment & Plant".

Paul Air Engineers Pvt. Ltd. -- See under "Valves".

S.J. Roy, B-59 Defence Colony, New Delhi 110 024. Tel: (011) 4694689, 4623224. Fax: (011) 4623224.

Santosh Engineering & Fabricators -- See under "Boilers".

Techno Equipments, Saraswati Sadan, 31 Parekh St., Bombay 400 004. Tel: 3851258, 5515640. Gram: FOODEQUIP, Bombay 4.

Tricon Food Machinery Co., 5A

Mayur, Off Bhayandar Rd., 771 Deccan Gymkhana, Pune 411 004. Tel: (0212) 342203, 344607, 342451. Fax: (0212) 342451.

Vamp Engineers Pvt. Ltd., 203 Rajguru Apts., New Nagardas Rd., Andheri (E). Bombay 400 069. Tel: 8380548/8384173. Fax : 91-22-8390195.

Varun Industries, Opp. Portuguese Church (W), Bombay 400 028. Tel : 4304850/4229400. Fax: 022-4362283.

FORM-FILL-SEAL MACHINES

Autopack Machines Pvt. Ltd. -- See under "Bottle Filling & Sealing Machines".

Gansons Engineers Pvt. Ltd., 118/121 Swastik Chambers, Off. Sion Trombay Rd., Chembur, Bombay 400 071. Tel: 524548/524967.

Grip Engineers, 7/8, Meghwadi Naka, Opp. Maratha Mandir Co-op. Bank, Megh Wadi, Jogeshwari (East) Bombay 400 060. Tel : 645 5103/6455079.

New Indo International (Regd.) -- See under "Pillow Pack Packing Machines".

Rajhans Enterprise, No. 101 Sai Deep Shopping Centre, Chembur Govandi Rd., Opp. Vaishali Hotel, Chembur (West), Bombay 400 071. Tel: 5557574. Fax: 5160769.

Samarpan Fabricators Ltd. -- See under "Filling & Sealing Machines".

Unique Flexo Packaging-- See under "Filling & Sealing Machines".

FREEZERS

General Air Conditioning Co. -- See under "Cold Storage Plant/Equipment".

Industrial Refrigeration Pvt. Ltd. -- See under "IQF Spiral Freezers".

FRUIT CRUSHER

Techno Equipments -- See under "Food Processing Equipment/Plants".

FRUIT JUICE BOTTLING PLANT

Sangram Engineering Pvt. Ltd. -- See under "Turnkey Plants/Projects".

FRUIT & VEGETABLE PROCESSING PLANT/MACHINERY

Eastend Engineering Co., 173/1 Gopal Lal Thakur Rd., Calcutta

Bombay Industrial Engineers

430, Hind Rajasthan Centre
D.S. Phalke Road, Dadar (C. Rly.)
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- * Boilers - Thermopacks
- * Sigma Kneaders, High Speed Mixers Planetary Mixers & Powder Mixers
- * Weighing Machines
- * BOPP/Industrial Tapes Manufacturing Machine & Plant

700 035. Tel: 526324, 523416.

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery".

Industrial Refrigeration -- See under "IQF Spiral Freezers".

Orbit International Technologies Pvt. Ltd. -- See under "Machinery, Potato Processing".

SSP Pvt. Ltd., 13 Mile Stone, Faridabad 121 003. Tel : 0129-277442/275968/277730. Fax : 0129-277441/011-6847665.

Sangram Engineering Pvt. Ltd. -- See under "Turnkey Plants/Projects".

Synergy Agro-tech (P) Ltd. -- See under "Airconditioning/Refrigeration Plant/Equipment".

Techno Equipments -- See under "Food Processing Equipment/Plant".

FUMARIC ACID

Amit Fine Chem -- See under "Agar Agar (Powder/Strips)".

Olin Chemicals -- See under "Acetic Acids".

GAS/OIL BURNERS

Classic Enterprises, 101 Jehangir Mansion, Cinema Rd.,

Behind Metro, Bombay 400 020. Tel: 2088291, 2058916. Fax: 91-22-2080404.

GAS DISPENSING MACHINE

Packera, 34 Kokate Bldg., Bhosalenagar, Pune 411 007. Tel: 0212-327209.

GELATINE

Kiran Kotak & Co., 414/418 M.J. Phule Market (Crawford Market), Bombay 400 001. Tel : 3429580, 3442796. Fax : 3429580.

GLASS & GLASSWARES

R.G. Glass Agency -- See under "Bottles & Jars, Glass".

GLASS FABRICS, PTFE COATED

Unnati Corporation -- See under "Adhesives/Tapes, PTFE, Glass".

GLUCOSE, LIQUID

See also "Liquid Glucose".

Amruth Starch Private Ltd., Morampudi Post, Hukempeta, Rajahmundry 533103. Tel : 61106.

S.A. Chemicals -- See under "Sorbitol"

GRAINS & CEREALS CLEANING/GRADING MACHINERY

Forsberg Agritech (India) Pvt. Ltd. 315, Race Course Towers, Race Course Circle, Baroda - 390 015. Tel: (0265) 340597. Fax: (0265) 338150.

Goldin (India) Equipment Pvt. Ltd. 1st fl., Saraswati Industrial Estate, Opp. Chhani Jakat Naka, Vadodara 390 002. Tel: (0265) 481452. Fax: (0265) 481452.

GRAVITY SEPARATOR

Forsberg Agritech (India) Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery".

Goldin (India) Equipment Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery".

John Fowler (India) Limited, Sarjapur Road, Bangalore 560 034. Tel: 5530026. Fax: 91-08-5533228. Tlx: 08452545.

GRINDER, WET & DRY

New Canara General Stores, 178 Dr. Babasahab Ambedkar Rd., Byculia, Bombay 400 027. Tel : 3722031.

Sesa Pulverisers, Kala Kila Road, Dharavi, Bombay 400 017. Tel: 4121434.

GRINDING MILLS

Frigmaires Engineers -- See under "Agitators".

Sesa Pulverisers -- See under "Grinder, Wet & Dry".

GUAR GUM

Ace International, 13/21, Laura Bldg., 1st Floor, Office No. 5B, 1st Dhobi Talao Lane, Bombay 400 002. Tel: (O) 2001413/2008169. Fax: 91-22-2093240.

Alok Chem Corporation, 406, Goradia House, P.O. Box No. 13048, 100/104, Kazi Syed Street, Bombay 400 003. Tel: 3426390/5365. Res: 5648355. Fax: 91-22-3415668.

Indian Gum Industries Ltd., 15-A, Maker Chamber IV, Nariman Pt., Bombay 400 021. Tel : (022) 2852075, 76, 77. Fax : 0091-22-2040393. Tlx: (011) 82139 IGUM, 83248 IGIL

Kapadia Gumchem Industries, 3, Mint Road, 2nd Floor, Room No. 30, Opp. G.P.O. Box No. 1160, Bombay 400 001. Tel: 2615073/2617217. Gram: PHARMAGUM. Fax: 91-22-2619423.

Swastik Gum Industries (India) 328 G.V.M.M. Vasahat, Odhav, Ahmedabad 382415. Tel: 870063/870064/870065. Tlx: 011-73265 KATR IN (Bombay).

GUAR GUM POWDER

Ace International -- See under "Guar Gum".

Indian Gum Industries Ltd. -- See under "Guar Gum".

Kapadia Gumchem Industries -- See under "Guar Gum".

GUM ACACIA

Ace International -- See under "Guar Gum".

Alok Chem Corp. -- See under "Guar Gum".

Drytech Processes (I) Pvt. Ltd., B-16 Girikunj Indl. Estate, Mahakali Caves Rd., Andheri (E), Bombay 400 093. Tel: 8378915/8326494/8301918/8210401. Fax: 022-8367442, 8364753.

GUM ALGEL

Alok Chem Corp -- See under "Guar Gum"

GUM ARABIC

Ace International -- See under "Guar Gum"

Alok Chem Corp -- See under "Guar Gum".

Balaji Dye Chem -- See under "Additives, Food & Beverage".

Drytech Processes (I) Pvt. Ltd. -- See under "Gum Acacia".

Kapadia Gumchem Industries, -- See under "Guar Gum".

Kushalchand Sons, Devkaran Mansion, Block No. 1, 2nd Floor, 79 Princess Street, Bombay 400 002. Tel : 205 2190/2080937. Fax: 91-22-2084265.

GUM BOILING PANS

Cosywo Engineering Company -- See under "Chemical Plant & Equipment".

GUM GHATTI

Ace International -- See under "Guar Gum".

Drytech Processes (I) Pvt. Ltd. -- See under "Gum Acacia".

GUM KARAYA

Ace International -- See under "Guar Gum"

Alok Chem Corporation -- See under "Guar Gum".

Drytech Processes (I) Pvt. Ltd. -- See under "Gum Acacia".

GUM TRAGACANTH

Ace International -- See under

"Guar Gum".

Alok Chem Corporation -- See under "Guar Gum".

GUMS, FOOD

Ace International -- See under "Guar Gum"

Alok Chem Corp. -- See under "Guar Gum".

Burzin and Leons Agenturen Pvt. Ltd. -- See under "Additives, Food & Beverage"

Drytech Processes (I) Pvt. Ltd. -- See under "Gum Acacia".

Great Blends, 5/1 Fourth Main Rd., Jayanagar Extn., Mysore 570014. Tel : 080-26990.

IDL Arom International Ltd., Nirmal, 15th fl., Nariman Pt., Bombay 400 021. Tel: (91) 22-2026946/2025318/2041267, Fax: (91) 22-2041187, Tlx: 011-82539 IDLB IN.

Indian Gum Industries Ltd. -- See under "Guar Gum"

Kapadia Gumchem Industries -- See under "Guar Gum".

Olin Chemicals -- See under "Acetic Acid".

GUM, XANTHAN

Ace International -- See under "Guar Gum"

Burzin & Leons Agenturen Pvt. Ltd. -- See under "Additives, Food & Beverage".

Indian Gum Industries Ltd. -- See under "Guar Gum".

HEAT EXCHANGERS

Arctic India Sales -- See under "Dehumidifiers".

Excelsior Engineers -- See under "Cooling Towers".

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing".

Praj Industries Ltd., Process Equipment & Systems Div., 103 & 203 Erandwane Indl. Area, Off Karve Rd., Opp. SNDT College, Pune 411 038. Tel : +91-212-361013. Fax : +91-212-363039.

HEATING ELEMENTS

Subhash Gupta & Co., A-45 Nand Gram, Meerut Rd., Ghaziabad 201 003. Tel: (0575) 8-733866. Fact: (011) 2293795.

HEATING MANTLES

Lab Instruments, Ratnadeep, 1st Floor, 78, B. Jaganath Shankar Seth Rd., Behind Panchratna, Near

Roxy, Opera House, Bombay 400 004. Tel: 3610973. Fax: 3634619.

Manikant Bros.--See under "Anti-Corrosion Chemicals".

Subhash Gupta & Co. -- See under "Heating Elements".

Thermal Instruments & Equipments -- See under "Dairy Laboratory Equipments".

HERBS

Rupande Food Products, 52 Shivajinagar, N.M. Joshi Marg, Lower Parel (E), Bombay 400 013. Tel : 306 0357.

HOMOGENIZERS

Cosywo Engineering Co. -- See under "Chemical Plant & Equipment"

Dairy Den (India) Pvt. Ltd., 25 Madhuvan, Ellisbridge, Ahmedabad 380 006. Tel: 461205/449538. Fax : 079-443537. Tlx : 0121-7157 DDPL IN.

Dairymac Engineering Pvt. Ltd. -- See under "Dispensers, Beverages"

Fibre & Fibre Products -- See under "Stirrers"

Frigmaires Engineers -- See under "Agitators".

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

Indrayani Agro Industries Pvt. Ltd., D-56 MIDC Additional Industrial Estate, Ambad, Nasik 422010. Tel : 382483. Fax : 381267.

Mamko Process Equipment Manufacturers -- See under "Emulsifiers".

HOT WATER GENERATORS

Ross Thermal Systems Pvt. Ltd. -- See under "Steam Boilers"

HUMIDIFIERS

Arctic India Sales -- See under "Dehumidifiers".

HYDROMETERS

Industrial Instruments Co. -- See under "Temperature Indicators/Controllers"

HYGROMETERS

Industrial Instruments Co. -- See under "Temperature Indicators/Controllers"

ICE CUBE MACHINE

Dairy Den (India) Pvt. Ltd. -- See under "Homogenizers"

Multifrig Marketing Co. (P) Ltd. -- See under "Cooling Cabinets"

ICE MAKING MACHINERY

Industrial Refrigeration, 9th Fl., Maker Chambers, V. Nariman Point, Bombay 400 021. Tel: 2041183, 85, 89, 2872363, 2872379. Gram: KOOLFAST. Tlx: 011-84130 RUJA IN/ 011-84275 INCO IN. Fax: (91-22) 2044944.

Snowball Enterprises, Shop No. 44, Panchratna, Gr. Fl., Opera House, Bombay 400 004. Tel: 3640335. Fax: 91-22-3614863.

ICE CREAM CONE MACHINES

Gemini Engineers, 12-B Shama Apartments, 138/1, P.G. Road, Secunderabad 500 003. Fax: 0091-040-84882.

R & D Engineers, A-41/1, I.D.A. Kukatpally, Phase II, Road No. 4, Hyderabad 500 037. Tel: 040-279121/279878. Fax: (040) 278668.

ICE CREAM MAKING MACHINES

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

The Panchal Workshop, P.B. No. 62, Anand Sojitra Rd., Anand 388 001. Tel: (02692) 34332, 34399. Tlx: 0172-251 VUJA IN. Fax: (02692) 34332/46454.

Synergy Agro - tech (P) Ltd. -- See under "Air conditioning/Refrigeration Plant/Equipment"

IDLI MACHINES/PLANTS

Sri Rajalakshmi Commercial Kitchen Equipment P. Ltd. -- See under "Deep Fat Fryers"

IMPROVERS

Davars M.P. Organics -- See under "Emulsifiers, Food"

IMPULSE SEALERS

Sarlech Electro Systems, 14462/1 Bhagwan Nagar, Near Savitri, Complex, G.T. Rd., Ludhiana 141003. Tel: 531444; Gram: SARLE HEAT. Tlx: 0386-384 PSIC-IN-ATTN. Fax: 091-164-532871.

Shubhada Enterprises, 2991, 1st Fl., Mahakavi Kuvempu Rd., Mariyappana Palya, Bangalore 560 021. Tel: 325 734.

Swastik Packaging, 4 Dev Sadan, Chimatpada, Behind Hotel Ruby, Marol Naka, Andheri (E), Bombay 400 059. Tel: 8324673, 8341340. Fax: 91-22-8388198.

INDUSTRIAL GAS MONITORS

Subtronics, Kaliandas Udyog Bhavan, Unit No. 147, Near Prabhadevi H.P.O. Bombay 400 025. Tel: 4224461/4303047

INDUSTRIAL HEATERS

Subhash Gupta & Co. -- See under "Heating Elements"

INSECTICIDES

Ultima Search, Excel Estate, S. V. Road, Goregaon (W), Bombay 400 062. Tel: 8751618, 8724174.

INSECT KILLERS (Insectocutors, Electric)

Opel Industries -- See under "Fly Killers, Electric"

Pest Control (India) Ltd. -- See under "Air Curtains"

Varun Industries, Opp. Portuguese Church, Dadar (West), Bombay 400 028. Tel: 4304850. Fax: 4362283

INSTRUMENTS, INDUSTRIAL AND PROCESS CONTROL

Lab Instruments -- See under "Heating Mantles"

Tata Honeywell Limited -- See under "Controllers, Flow, Label, Temp. etc."

INSTRUMENTS, TESTING

Ion Exchange (India) Ltd. -- See under "Water Treatment Plants/Equipment"

INVERT SUGAR SYRUP

Dhampur Invertos Ltd., 24 School lane, Opp. The Hilton, New Delhi 400 001.

ION EXCHANGE RESINS

Aqua Filsep Inc. -- See under "Water Treatment Plants/Equipment"

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Industrial Refrigeration Pvt. Ltd., 901 Maker Chambers V, Nariman Point, Bombay 400 021. Tel: 2041 183/85/89. Fax: (91-22) 2044944; Gr: KOOLFAST. Tlx: 011-84130 RUJA IN.

JERRY CANS

Rajdeep Plastics, 17 Jamnadas Indl. Estate, Dr. R.P. Road, Opp. Jawahar Talkies, Mulund (W), Bombay 400 080. Tel: 5641972. Fax: (0091) 5645833. Tlx: 011-71941 RAJ IN.



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JUICE EXTRACTOR

Bombay Industrial Engineers -- See under "Machinery, Food & Beverage Processing"

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Geeta Food Engineering -- See under "Food Processing Equipment/Plant"

Techno Equipments -- See under "Food Processing Equipment/Plant"

KETTLES (STEAM JACKETED)

See also under "Steam Jacketed Kettles"

Continental Equipment India Pvt. Ltd. -- See under "Bakery/Biscuit Equipment"

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Geeta Food Engineering -- See

under "Food Processing Equipment/Plant"

Techno Equipments -- See under "Food Processing Equipment/Plant"

KITCHEN EQUIPMENT

Advance Equipments Co. -- See under "Air Conditioning & Refrigeration Plant/Equip."

Continental Equipment India Pvt. Ltd. -- See under "Bakery/Biscuit Equipment"

Essee Kitchenaid, "Shreeniwas House", 98 Dattaram Lad Marg, Bombay 400 003. Tel: 4114485, 4136393, 4135982. Cable: KITCHENTOP. Tlx: 011-3920. Fax: 3780960.

Frigmaires Engineers -- See under "Agitators"

Kitchen Udyog, 112 Reshab Shree House, Commercial Complex, New Delhi 110008. Tel: 570 3616.

New Canara General Stores, 178 Dr. Babasaheb Ambedkar Rd., Byculla, Bombay 400 027. Tel: 3722031.

Vipul Engineering Equipment, 13th Girish Kunj, Rd., No. 3, Juhu Scheme, Vile Parle (W), Bombay

400 056. Tel: 6145100, 8080692.
Fax: 022-4943409.

KITCHEN FOIL

Foil Impex (Bombay) Pvt. Ltd.,
66 Bharat Mahal, 86 Marine Drive,
Bombay 400 002. Tel : 91-22-
2017202/2011401. Fax : 91-22-
4950467.

KNEADERS

Fabdecon Engineers -- See under
"Agitators".

Frigmaires Engineers -- See under
"Agitators".

Vipul Engineering Equipment
-- See under "Kitchen Equipment".

LPG BOTTLING PLANT

Globe Gas Equipments Industry
Pvt. Ltd. -- See under "Burners/
Fittings, Commercial"

LABELLING MACHINES

Ambica Labelling Pvt. Ltd.,
Plot No. A/2 Phase II, GIDC,
Vatva, Ahmedabad 382 445. Tel :
5831346/5830153. Fax: 079-
5835885.

Bhavani Sales Corporation, Plot
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Ahmedabad 382445. Tel :
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009. Tel: 079-6427866. Fax: 079-
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Lab Instruments -- See under
"Heating Mantles".

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Swastik Society, Navrangpura,
Ahmedabad 380 099. Tel: 409183/
452456. Fax: 0272-425456.

Wonderpack Industries (P) Ltd.
-- See under "Bread/Biscuit Pack-
ing Machinery"

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Gopal Engineering Works, Part
2/5 Kailash Ind. Estate, Behind
C.M.C. Odhav, Ahmedabad 382
415. Tel : (079) 2874969.

Jacsons Engineers, Phase 4,
Plot No. 4701, G.I.D.C. Ind. Es-
tate, Vatva, Ahmedabad 382 445.
Tel: 830156. Gram : JALDEEP.
Fax: 91-079-833408.

LABORATORY EQUIPMENT

Lab Instruments -- See under
"Heating Mantles".

LABORATORY, TESTING

Bangalore Test House, 65, 20th

Main, Marenhalli, Vijaynagar,
Bangalore 560 040. Tel: 3356415,
Gram: TEST HOUSE.

LACTIC ACID

Balaji Dye Chem -- See under
"Additives, Food & Beverage".

Lactochem Ltd., 18 Venu
Reddy St., Guindy, Madras 600
032. Tel: 044-234-789. Gr:
LACTOCHEM. Fax: 044-
2343857.

Sesu Trading Corp -- See under
"Acids".

LACTOSE

S.A. Chemicals -- See under
"Sorbitol"

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Fax: 91-22-532033.

LEADER LINE CONTROLLER

Tata Honeywell Limited -- See
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Level, Temp., Misc"

LEMON OIL

Aroma Impex -- See under "Ar-
omatic Chemicals".

Olin Chemicals -- See under
"Acetic Acid".

Vidarbha Fruit Products Co.
Pvt. Ltd. -- See under "Calcium Ci-
trate"

LIME OIL

Aditi Pectins Pvt. Ltd. -- See
under "Pectin"

Olin Chemicals -- See under
"Acetic Acid".

Vidarbha Fruit Products Co.
Pvt. Ltd. -- See under "Calcium
Citrate"

LIPIDS, FOOD

Vidarbha Fruit Products Co.
Pvt. Ltd. -- See under "Calcium
Citrate"

LIQUID GLUCOSE

Vertex Chemicals, 301-B, Her-
itage House, Gundavli Cross Rd.,
No. 2, Andheri East, Bombay 400
069. Tel/Fax: 8218004.

LIQUOR FLAVOURS

Oror Flavours & Chemicals Pvt.
Ltd. -- See under "Food Flavours".

LOCUST BEAN GUM

Kushalchand Sons -- See under

"Gum Arabic"

LUG CAPS

Larsen & Toubro Ltd., (Pack-
aging Div.)-- See under "Bottle
Caps & Closures"

LUG CAP SEALING MACHINE

Raj Products & Equipment,
P.O. Box 8075, Bombay 400 056.
Tel: 8192250, 8192750. Res:
6102035, Fax: 8375628.

MACHINERY, BLISTER PACKAGING

Sarlech Electro Systems -- See
under "Impulse Sealers"

Samarpan Fabricators Ltd. --
See under "Filling & Sealing Ma-
chinery"

MACHINERY, CONFECTIONERY

Continental Equipment India
Pvt. Ltd. -- See under "Bakery/Bis-
cuit Equipment".

Fabdecon Engineers -- See un-
der "Agitators".

Frigmaires Engineers -- See
under "Agitators".

MACHINERY, DAIRY PROCESSING

See also under "Dairy Plant
& Equipment"

Fabdecon Engineers -- See
under "Agitators".

MACHINERY, FOOD & BEVERAGE PROCESSING See also "Food Processing Machinery/Equipment".

Bombay Industrial Engineers,
430 Hind Rajasthan Centre, D.S.
Phalke Rd., Dadar (C. Rly.),
Bombay 400 014. Tel : 411 3999/
4114275. Gr: BOMBING,
Bombay 14.

Food Tech Engineers, 31A,
Ghanshyam Ind. Estate, Veera
Desai Road, Andheri (West),
Bombay 400 058. Tel: 6269106,
6234718. Fax: 91-22-6267298/
6269106.

Industrial Refrigeration Pvt.
Ltd. -- See under "IQF Spiral Freez-
er"

J.T. Jagtiani, National House,
Tulloch Road, Apollo Bunder,
Bombay 400 039. Tel: 2020028/
2021433.

Sangram Engineering Ltd., B-
5 Supercon, Opp. III, Aundh, Pune
411007. Tel : 366935, 342302. Fax
: 349673.

Vamp Engineers Pvt. Ltd., 203

Rajguru Apts., New Nagardas Rd.,
Andheri (E), Bombay 400 069. Tel
: 91-22-8390195.

MACHINERY, MEAT PROCESSING

Food Tech Engineers -- See
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age Processing"

Orbit International Technolo-
gies Pvt. Ltd. -- See under "Ma-
chinery, Potato Processing"

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ble Road, K.H. Rd., Bangalore 560
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2216514. Fax: 91-(0)80-2216165.

Aarkay Wrapping Machines
Pvt. Ltd., 1, Hormuzd, 131, August
Kranti Marg, Bombay 400 036.
Tel: 3670537, 367-5277. Fax : 91-
22-3670217. Gram:
CRAFTWORLD.

Autopack Machines Pvt. Ltd. -
- See under "Bottle Filling & Seal-
ing Machines"

Frigmaires Engineers -- See un-
der "Agitators".

Grip Engineers -- See under
"Form-Fill-Seal Machines".

Kavacha Engineering, 33, E.C.
Extn., Kusahaiguda, Hyderabad 500
762. Tel: 623665/863995. Fax:
620892.

M.K. Agencies, 275/279, Shriji
Bhavan, 1st Floor, Samuel Street,
Vadgadi, Bombay 400 003. Tel :
3437520, 3413308.

Noble Polymech Corporation,
W-102 MIDC, Phase 2, Dombivli
421204, Bombay 421204. Tel :
470453. Fax : (0251) 470453.

Pakona Engineers (India) Pvt.
Ltd., 22-D, Wadia Charities Bldg.,
2nd Floor, S.A. Brelvi Street, Fort,
Bombay 400 023. Tel: 2872181/
2874642.

R.G.K. Enterprises, Madhu
Kunj, Vinod Baug, Juhu-Line,
Block No. 12, Ground Floor,
Andheri (W), Bombay 400 058.

Rathi Industrial Equipment Co.
Ltd. -- See under "Size Reduction
Equipment"

Recon Machine Tools Pvt. Ltd.,
37 Sarvoday Indl. Estate, Mahakali
Caves Rd., Andheri (E), Bombay
400 093. Tel: 834973, 8343913.
Fax : 022-8361074.

Sarlech Electro Systems -- See
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Samarpan Fabricators Ltd. --
See under "Filling & Sealing Ma-
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Selall -- See under "Filling Machinery, Bag/Pouch"

Sil & Pack Industries, 30 Laxmi Ind. Estate, New Link Rd., Andheri (W), Bombay 400 058. Tel : (022) 6266535. Fax : 91-22-6266535.

St. Joseph Engg. Works, 216/304 - A Manish Commercial Centre, 3rd Fl., Next to Century Bazar, Dr. A.B. Rd., Worli, Bombay 400 025. Tel: 4932653, 3025541.

Tinmaco Engg. Co. (Bombay) Pvt. Ltd.-- See under "Tin Can Machinery Machine"

Unique Flexo Packaging -- See under "Automatic Form-Fill-Seal machines".

W.R. Grace & Co. (India) Pvt. Ltd. -- See under "Packing Materials"

Wonderpack Industries (P) Ltd. -- See under "Bread/Biscuit Packing Machinery"

MACHINERY, PACKAGING, FLEXIBLE

Chinoy Electronics -- See under "Standipouch Machinery"

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Packpet Industries, 3-B, Sherbanoo, 111, M.K. Road, Mumbai 400 020. Tel : 2088650, 2088901. Fax: 2068636.

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Sri Rajalakshmi Commercial Kitchen Equipment P. Ltd. -- See under "Deep Fat Fryers"

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Orbit International Technologies Pvt. Ltd. 404 Taramandal Complex Secretariat Rd., Hyderabad 500 004. Tel : 241216/597798. Fax: (040) 599068.

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Goma Engineering Pvt. Ltd.-- See under "Beverage Processing Machinery"

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Steelsworth Ltd., Circular

Court, 8 A.J.C. Bose Rd., Calcutta 700 017. Tel (033) 2470238/2470165. Fax : (033) 2472649. Tlx : 021-5065

MACHINERY, TOMATO PROCESSING

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

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Perfect Magnets Pvt. Ltd., 14 /1 Vishwabharti Co-op. Hsg. Society, Akshay Bldg., V.P. Rd., Andheri (W), Bombay 400 058. Tel: 6212570, 8379336.

MALEIC ACID

Olin Chemicals -- See under "Acetic Acid".

MALT & GRAIN HANDLING EQUIPMENT

Goldin (India) Equipment Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery".

MALTODEXTRINE

Olin Chemicals -- See under "Acetic Acid".

S.A. Chemicals -- See under "Sorbitol"

Vertex Chemicals -- See under "Liquid Glucose"

MATERIAL HANDLING SYSTEMS

Mac Industrial Systems, C/80, Snehdhara Society, Dadabhai X Road No. 3, Vile Parle (W), Bombay 400 056. Tel: 8215993.

Selvel Conveyors, 17A, & 63C, Balaji Industrial Estate, Hanuman Nagar, Akurli Road, Kandivali (E), Bombay 400 101. Tel : 887 23 03/883 86 63/3899, Fax : 91-022-8870605.

Shirke Structurals Pvt. Ltd. -- See under "Silo Storage System"

Waghela Brothers -- See under "Conveyors"

METAL CONTAINERS

Divecha Glass Industries, 249 Bal Rajeshwar Rd., Mulund (W), Bombay 400 080.

METAL DETECTION EQUIPMENT

McNally Bangalore Industries Ltd. -- See under "Dehydration Plant/Equipment"

Rathi Industrial Equipment Co. -- See under "Size Reduction Equipment"

METERING PUMPS

Jagdish Engg. Works-- See under "Pumps".

MICROBE DETECTION DEVICE

Rakiro Biotech, 27 Sahayog, 3rd Fl., 33/35, R.S. Sapre Marg, Kalbadevi, Bombay 400 002. Tel: 91-22-2095837, Fax: 91-22-3631303.

MILK POWDER PLANT

Goma Engineering Pvt. Ltd.-- See under "Beverage Processing Machinery"

MILK/MILK PRODUCTS PROCESSING PLANT

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing".

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

MILK SHAKE MACHINE

Akshay Industries, 107 Rajshree Indl. Area, Chitalsar Manpada, Ghod Bunder Rd., Thane 400 607, Mumbai. Fax: 0091-21-5335188.

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Clair Packaging Pvt. Ltd.-- See under "Bottle Caps & Closures"

MINERAL WATER FILLING PLANT

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Food Tech Engineers-- See under "Machinery, Food & Beverage Processing".

Komal Industries -- See under "Water Treatment Plants/Equipment"

Shriyan Enterprises, 12A Sagar Complex, Bombay - Pune Rd., Kasarwadi Nasik Phata, Pune 411 034. Tel : 779341. Fax : C/o. 0212-779409.

Shivsu Watek (P) Ltd., 14 Spur Tank Rd., Chetput, Madras 600 031. Tel : 8266073/8266083/8266074. Fax : 91-44-8256606.

Venus Packaging Services-- See under "Crown Cap PCV Lining Machine".

MINT OIL

Bhagat Impex Pvt. Ltd.-- See under "Essential Oils".

MIXERS, INDUSTRIAL

Cosywo Engineering Company-

- See under "Chemical Plant & Equipment".

Fabdecon Engineers-- See under "Agitators".

Fibre & Fibre Products -- See under "Stirrers".

MIXERS, POWDER & PASTE

Fabdecon Engineers-- See under "Agitators".

Frigmaires Engineers-- See under "Agitators".

Metal Plants -- See under "Contra-Rotary Mixers".

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MUSHROOM PROCESSING PLANT

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing".

Sangram Engineering Pvt. Ltd.- See under "Turnkey Plants/Projects".

OIL FIRED BOILER

Kalpna Boilers & Chemical Plants Mfg. Co.-- See under "Boilers".

OIL SEEDS CLEANING / GRADING MACHINERY

Forsberg Agritech (India) Pvt. Ltd.-- See under "Grains & Cereals, Cleaning/Grading Machinery".

Goldin (India) Equipment Pvt. Ltd.-- See under "Grains & Cereals Cleaning/Grading Machinery".

OLEORESINS

L.B. Aroma Chemicals -- See under "Aromatic Chemicals".

Synthite Industrial Chemicals Ltd., Kadayiruppu, Kolencherry 682 311, Kerala. Tel: 04853-60285. Fax: 91-484-370405.

OLEIC ACID

Soofi Traders -- See under "Orange Oil".

ORANGE OIL

Balaji Dye Chem-- See under "Additives, Food & Beverage".

Kushalchand Sons -- See under "Gum Arabic"

Sesu Trading Corp-- See under "Acids".

Soofi Traders, 1317 Dalamal Tower, 211 Nariman Point, Bombay 400 021. Tel: 204 3044/204 5748/2833074. Fax: 2047657

OVENS, BREAD/BISCUIT BAKING

Admir Engineers -- See under "Bakery/Biscuit Equipment".

Aifso Enterprises, A/1, Veena Beena Apts., Sewri (W), Bombay 400 015. Tel: Off: 4137339/4130926. Res: 4137109/4134568. Fax: 91-22-4137339.

Continental Equipment (India) Pvt. Ltd., -- See under "Bakery/Biscuit Equipment".

Grover Pvt. Ltd. -- See under "Bakery/Biscuit Equipment".

Sarlech Enterprises (India) -- See under "Bakery/Biscuit Equipment".

OVENS, INDUSTRIAL

Flora Engineering Co., A-4/A-42, Laghu Udyog Kendra, I.B. Patel Rd., Goregaon (E), Bombay 400 063. Tel: 8735768. Fax: 91-22-2873059.

OVENS/TRAY DRYERS

See also "Dryers, Oven/Tray, etc.

Aifso Enterprises -- See under "Ovens, Bread/Biscuit Baking".

Continental Equipment India Pvt. Ltd. -- See under "Bakery/Biscuit Equipment".

Frigmaires Engineers -- See under "Agitators".

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P.P. CAPS

A to Z Bottle Suppliers-- See under "Bottles & Jars, Glass".

Larsen & Toubro Ltd. (Packaging Div.) -- See under "Bottle Caps & Closures".

P.P. CAPS MACHINERY

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PACKAGING DESIGNERS

Kalrav Packaging Co., A/62 Tarang Drug Employees Co-Op. Hsg. Soc., Unit No. 3, Gilbert Hill, Andheri West, Bombay 400 058. Tel: 6249330, 6201584, Fax: 91-22-6236196.

PACKAGING FILM

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Plastic International-- See un-

der "Packaging Material".

Samarpan Converters Ltd. -- See under "Laminated Packaging Film".

PACKAGING MATERIAL

Bhavnani & Sons Pvt. Ltd., See under "Film, Plastic/Metallized".

Compacq Packaging, P-19 Vikas Compound, Vadoli, Chembur, Bombay 400 074. Tel: 5551919. Fax: 5561938.

Divecha Glass Industries (Metal Container Div.) -- See under "Containers, Metal".

Fine Plast Industries Pvt. Ltd., Sarang Street, Taher Bldg, 1st Flr., Bombay 400 003. Tel: 329303/345075. Grams: POLUDRUMS.

Plastic International, B/13, Nanddham Indl. Estate, Marol, Andheri (E), Bombay 400 059. Tel: 8320798/8322683. Tlx: 11-79498. Gr: Interplast. Fax: (011) 8366237.

Samarpan Fabricators Ltd. -- See under "Filling & Sealing Machine".

W.R. Grace & Co. (India) Pvt. Ltd., 426, 3A Cross, 16th Main, III Block, Koramangala, Bangalore 560 034. Tel: (080) 5534522. Fax: (080) 553 4500.

PALLET HANDLING SYSTEM

Mac Industrial Systems-- See under "Material Handling System".

PAPAINS

Rathi Papains Pvt. Ltd., 105 Dhanlaxmi Indl. Estate, Old Agra Rd., Thane (W) 400 601. Tel: (022) 504011. Tlx: 1182844. Fax:

2872811.

PARAFFIN WAX

Balaji Dye Chem -- See under "Additives, Food & Beverage".

PASTEURIZERS

MF Marketing Pvt. Ltd., B-15, Arjun Centre, B.S. Devashi Marg, Govandi, Bombay 400 088. Tel: 5557515/5560947. Tlx: MF IN 76502. Fax: 91-22-5560569.

McNally Bangalore Industries Ltd., -- See under "Dehydration Plant/Equipment".

Machinfabrik -- See under "Cookers, Vacuum, Batch".

PASTE & LIQUID FILLING MACHINE

Bombay Engineering Industry, R. No. 6 (Extn) Sevantibai Bhavan, Chimatpada, Marol Naka, Andheri (East), Bombay 400 059. Tel: 836 9368, 8215795. Fax: 022 832 7448.

PECTIN

Aditi Pectins Pvt. Ltd., MIDC Plot No. B/8 Islampur 415409. Dist. Sangli (M.S.) Tel: (02342) 22343, 22348, 57550. Fax: (02342) 23064.

Balaji Dye Chem -- See under "Additives, Food & Beverage".

Concorde Chemical Corp. -- See under "B H A".

Indian Gum Industries -- See under "Guar Gum".

Kiran Kotak & Co. -- See under "Gelatin".

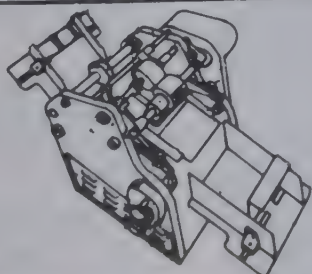
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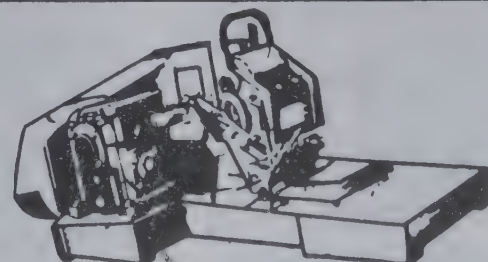
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M/c's Stroke : 45 per Minute (Maxi) 25 P/M (Mini.)
Electric : 0.25 H.P. Single Phase Motor
FOOT SWITCH OPERATED MULTI PURPOSE FOR CARTON & LABEL



For Printing
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Mfg. Date :
Exp. Date :
M. R. P. Etc.

Printing on Plain,
Varnish, Lamination & Polythen Bags



GOPAL ENGINEERING WORKS

Part 2/5, Kailash Ind. Estate Behind C. M.C.
Odhav Road Ahmedabad-382415 Tel. (079) 2874969

(KNS/ADI)

MIDC, Jalgaon 425003. Tel : (0257) 40510, 40535.

Saisha, Saisha House, 386 HAL Second Stage, Bangalore 560 008. Tel: 080-5280255. Fax: 080-5282384

Sesu Trading Corporation-- See under "Acids".

Southern Citrus Products (P) Ltd., Gudur 524101, Nellore Dist., A.P. Tel: 21328/21528.

Vidarbha Pectins Fruits Products Co. Ltd.-- See under "Calcium Citrate"

PEPTONE

Hi Media Laboratories Pvt. Ltd. -- See under "Culture Media"

PET/BOTTLE MACHINERY

East India Paper & Board Mills, 95 Park St., (9th fl.), Calcutta 700 016. Fax : 91-33-292128.

Shivsu Watek (P) Ltd.-- See under "Mineral Water Plant Machinery"

PHOSPHORIC ACIDS

Star Chemicals (Bombay) Ltd., 55/58 Jolly Maker Chambers No. 2, Nariman Point, Bombay 400 021. Tel: 2028029/2028728/2870165. Fax: 2027980. Tlx: 011-84025

PILLOWPACK PACKING MACHINES

New Indo International (Regd.), 135-A Begumpur, Malviya Nagar, New Delhi-110 017. Tel: 6445315, 6213289, 6217476, 6228290. Fax: 011-6213289/6228290.

Production Engg. Consultants, 206, Aakaar, Kalyan Complex, Yari Rd., Versova, Bombay 400 061. Tel: 6290161, 6271021.

Shree Ancillary Industries, B-17, Girikunj Indl. Estate, Off Mahakali Caves Rd., Andheri (E), Bombay 400 093. Tel : 8364914, 8216583. Fax: (91) 22-8379802.

Sil & Pack Industries -- See under "Machinery, Packaging"

PLANETARY MIXER

Cosywo Engineering Company -- See under "Chemical Plant & Equipment".

Fabdecon Engineers-- See under "Agitators".

Vamp Engineers Pvt. Ltd. -- See under "Machinery, Food & Beverage Processing"

PLATE EVAPORATORS

Praj Industries, 1216/6 Fergusson College Rd., Pune 411 004. Tel : 91-212-3212/3. Fax: 91-22-

321689.

PLATINUMWARE

Lab Instruments-- See under "Heating Mantles".

PNEUMATIC CONVEYING SYSTEMS

Crystal Automation Pvt. Ltd., Rajshree Ind. Complex, Bldg. No. 1 Unit No. 8 & 108, Behind Lawkin Ltd., Chitalsar, Manpada, Thane 400607. Tel : 532 7592. Fax : 91-22-5322249/5321940.

Indiana Conveyors Pvt. Ltd., Indiana House, Marol Naka, Andheri (E), Bombay 400 059. Tel: 8344743, 8384611. Tlx: 011-75208 IEW IN. Fax: 8367154.

Rathi Industrial Equipment Co. Ltd.--See under "Size Reduction Equipment".

POHA MACHINE

Durai Industrial Works, 1143 Mettupalayan Rd., Coimbatore 641043. Tel : 0422-442380. Fax : 91-0422-442250.

POTASSIUM META BISULPHITE

Balaji Dye Chem-- See under "Additives, Food & Beverage".

Sesu Trading Corp.-- See under "Acids".

POTASSIUM SORBATE

Concorde Chemical Corporation -- See under "B H A"

Kushalchand Sons -- See under "Gum Arabic"

POTATO STARCH

KMC Narayan, C/o. Narayan & Co., Mangalam Building, Kankuwadi, P.M. Road, Vile Parle (E), Bombay 400 057. Tel: 614 5952/6148226. Fax: 6101243.

POUCHES

Star Packaging, 81, Universal Industrial Estate, I.B. Patel Road, Goregaon (E), Bombay 400 063. Tel: 8732253, 6201344.

POUCH FILLING MACHINES

Autopack Machines Pvt. Ltd. - See under "Agitators"

New Indo International (Regd.) -- See under "Pillowpack Packing Machines".

Unique Flexo Packaging -- See under "Filling & Sealing Machine".

POUCH PACKAGING MACHINERY

Wrapid Packaging, Dharam-

chand Indl. Estate, Deonar Village Rd., Deonar, Bombay 400 088. Tel: 5512138.

POWDER/PASTE BLENDERS

Mamko Process Equipments Manufacturers-- See under "Emulsifiers".

POWDER FILLING MACHINE

See also "Filling Machines, Powder Granules"

Frigmaires Engineers-- See under "Agitators".

Shirsat Electronics-- See under "Shrink Wrapping Machines".

PRESERVATIVES

Hindustan Chemical Co., 77/B Juhu Supreme Centre, 2nd Fl., Gulmohar Rd., Bombay 400 049. Tel: 6204121, 6205464. Gr: BASICCHEM. Fax: 6201544.

PRESSURE GAUGES

Industrial Instruments Co. -- See under "Temperature Indicators/Controllers"

PRESSURE TRANSMITTER

Fisher Rosemount (India) Ltd. -- See under "Flow Meter"

PROCESS CONTROL EQUIPMENT/SYSTEMS

Tata Honeywell Limited -- See under "Controllers, Flow, Level, Temp, etc"

PROCESS PLANT/EQUIPMENT

Factor Engineering Co. Pvt. Ltd. -- See under "Demineralisation Plant/Equipment"

Goma Engineering Pvt. Ltd.-- See under "Beverage Processing Machinery"

Mamko Process Equipments Manufacturers-- See under "Emulsifiers".

PROCESS PUMPS

Union Enterprise, 113 Nagindas Master Rd., Fort, Bombay 400 023. Tel : 2671368/2676560. Fax : 2674071.

PROPYLENE GLYCOL

Olin Chemicals-- See under "Acetic Acid".

PROTEIN HYDROLYSATES

Warkem, 40 Vadhwani Industrial Estate, LBS Marg, Bombay

400 086. Tel: 5148746. Fax : 022-584748. Gram : STERILITY.

PULPER

Bombay Industrial Engineers - See under "Machinery, Food & Beverage Processing".

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing".

Geeta Food Engineering-- See under "Food Processing Equipment/Plant".

PULVERISERS

D.P. Pulveriser Works, Modi & Modi Bldg., 76, Nagindas Master Road Extn., Opp. Maharashtra State Co-op. Bank Ltd., Fort Bombay 400 023. Tel: 276435/274901. Grams: GRANULE

Frigmaires Engineers-- See under "Agitators".

PUMPS

Beer, Carbonator, Centrifugal, Rotary, Vacuum etc.

Alweyn Pumps & Systems Pvt. Ltd. -- See under "Fluid Process Application"

Filtron Engineers Ltd. -- See under "Dairy Plant & Equipment"

Flocon Valves & Pumps-- See under "Valves".

Flotech Industries, C-205 Gokul Accord, Thakur Complex, Kandivli (E), Bombay 400 101. Tel: 8873128/8873055. Fax: 022-8873055

Fristam Pumps (India) Pvt. Ltd., 117-A, Vithalwadi Rd., Pune-411 030. Tel: (0212) 440068, 444079. Tlx: (145) 7323 TRON IN. Fax: (0212) 447949.

Jagdish Engineering Works. 7/2, Rocky Industrial Estate, I.B. Patel Road, Goregaon (E), Bombay 400 063. Tel: 8731134. Fax : 8735555.

Jyoti Engineers, S/3, Raj Rajeshwari, Narayan Nagar, LBS Marg, Ghatkopar (West), Bombay 400 086. Tel: 5127568. Gram: VARIATOR. Fax: (022) 5164376.

SSP Pvt. Ltd. -- See under "Evaporators".

Technomech Pumps, Bombay Wire Compound, Gala No. 10, I.B. Patel Rd., Goregaon (E), Bombay 400 063.

Union Enterprises -- See under "Process Pumps"

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13/21 Laura Bldg., 1st Floor, Office No. 5B, 1st Dhobi Talao Lane, Bombay 400 002

Tel.: 2001413, 2008169 ❖ Fax: 91-22-2093240

EXPORT INQUIRIES SOLICITED

L.B.S. Marg, Ghatkopar (W),
Bombay 400 086.

REACTION KETTLES

Kanara Engineering Co. Pvt.
Ltd., Melville Estate, Ghatkopar
(East), Bombay 400 075. Tel:
5121365. Fax: 5160138.

REACTORS

Fabdecon Engineers-- See un-
der "Agitators".

REFRIGERATION EQUIPMENT/PLANT

Airtech Engineers, B-93 DHA
Okhla Indl. Area, New Delhi, Tel :
6912 711, 6912 013. Fax: 011-
6833207.

Excelsior Engineers-- See un-
der "Cooling Towers Pumps".

General Airconditioning Co--
See under "Cold Storage Plants/
Equipment".

Industrial Refrigeration-- See
under "IQF Spiral Freezer"

Kooling System -- See under
"Chilling Plants"

'Metacolor', Shree Precoated
Steel Ltd., Hanuman Bldg., 308
Perin Nariman Street, Fort,
Bombay 400 001. Tel: 2662540/
2661232. Tlx: 011-82793 YOGI
IN. Fax: 91-22-266 1878.

North Star Ice Equipment Co.
(I) Pvt. Ltd., 5 Krishna Kunj, 64/
31 Erandwana, Pune 411 004. Tel
: 0212-340973/348213. Fax : 0212-
348241.

RENNET

Kushalchand Sons -- See under
"Gum Arabic"

Olin Chemicals-- See under
"Acetic Acid".

RETORTS

Machinfabrik -- See under

"Coolers, Vacuum, Batch"

Techno Equipment-- See under
"Food Processing Equipment/
Plant".

RIBBON MILL

Fabdecon Engineers -- See un-
der "Agitators".

RINSING/FILLING/CAP- PING MACHINE

Shriyan Enterprises -- See un-
der "Mineral Water Filling Plant".

ROPP BOTTLE CAP SEALING MACHINE

Identical Parts, 242 Madhani
Estate, S.B. Marg, Dadar, Bombay
400 028. Tel : 4223019.

ROTARY DRIERS/COOL- ERS

McNally Bangalore Industries
Ltd.-- See under "Dehydration
Plant/Equipment"

SANDWICH GRILLER

Dairymac Engineering Pvt.
Ltd., 25 Madhuvan, Ellis Bridge,
Ahmedabad 380 006. Tel : 461
205/402 046. Tlx : 121-7157
DDPL IN. Fax : 91-79-443537.

SCREW CONVEYORS

Techno Link Conveyor Sys-
tems, 5 Shirguppe Ind. Estate, 41
Saki Vihar Rd., Bombay 400 072.
Tel : 832 08 53, 822 4782. Fax:
91-22-822 4782.

SEALING MACHINES

Grip Engineers -- See under
"Form-Fill-Seal Machines".

Protech Engineers (India), 884/
3 & 4 GIDC Estate, Makarpura,
Vadodara 390 010. Tel: 43280.

Sarlech Electro Systems -- See
under "Impulse Sealers"

Swastik Packaging -- See un-
der "Impulse Sealers"

SEED CLEANING MACHINERY

Forsberg Agritech (India) Pvt.
Ltd., --See under "Grains & Cere-
als Cleaning/Grading Machinery".

Goldin (India) Equipment Pvt.
Ltd. -- See under "Grains & Cere-
als Cleaning/Grading Machinery"

SEPARATION MACHIN- ERY

Forsberg Agritech (India) Pvt.
Ltd., 123 GIDC Indl. Estate,
Makarpura, Baroda 390 010. Tel :
445752/340597. Fax : 338150.

SESAME POLISHING MACHINE

Techno Equipment--See under
"Food Processing Equipment/
Plant".

SHRINK FILM

Nilkamal Poly Packaging Ltd.,
2nd Fl., Asarpota Chambers, C.G.
Rd., Navrangpura, Ahmedabad 380
009. Tel: 461020, 423940. Tlx:
0121-6262 NPPL IN.

Thermo Packaging & Market-
ing Corpn., 12 Nanik Motwane
Marg, Fort, Bombay 400 001. Tel:
270667, 270768.

W.R. Grace & Co. (India) Pvt.
Ltd. -- See under "Packaging Ma-
terial"

SHRINK/SKIN WRAPPING/PACKAGING MACHINES

Aarkay Wrapping Machines
Pvt. Ltd.--See under "Machinery,
Packaging".

Compack Systems, E-211, Flat-
ted Factories Complex, Okhla In-
dustrial Estate, Phase III, New
Delhi 110 020. Tel: 6831545,
6914065. Fax: 6841307.

Machinecraft -- See under
"Blister Sealing Machines"

Sarlech Electro Systems -- See
under "Impulse Sealers"

Shirsat Electronics, 133 Dewan
Indl. Est. No. 6, Vasai Rd., (E),
Thane. Tel: 8010250.

Swastik Packaging --See under
"Impulse Sealer".

SIFTERS

Ami Associates & Consultants
Pvt. Ltd., 13, Manoj Indl. Estate,
40-A, Katrak Rd., Wadala,
Bombay 400 031. Tel: 4133262/
4129233. Fax: 022-413-5638. AC-
DR-44. Tlx: 011-76330 AMI IN.

SILO STORAGE SYSTEM

Shirke Structurals Pvt. Ltd., 72-
76 Mundwa, Pune 411036. Tel :
670151/670152/670232. Tlx:
0145-7280 BG SP IN. Fax :0212-
671612.

SIZE REDUCTION EQUIPMENT

Frigmaires Engineers--See un-
der "Agitators".

Kaps Engineers, 831, GIDC,
Makarpura, Vadodara 390 010.
Telex: 0175-533 MICON IN.

Rathi Industrial Equipment Co.
Ltd., 1162/2 Shivajinagar, Behind
Observatory, Pune 411 005. Tel:
325384, 325215. Tlx: 0145-7798
RICO IN. Fax: (0212) 323229.

SNACKS MAKING MACHINERY

Sangram Engineering Ltd., B-
5, Supercon, Opp. IIT, Aundh Pune
410 007.

SODA WATER MACHIN- ERY

Maharashtra Essence & Gas
Suppliers -- See under "Essences
& Flavours"

SODIUM ALGINATE

Balaji Dye Chem--See under
"Additives, Food & Beverage".

Burzin & Leons Agenturen Pvt. Ltd.,--See under "Additives, Food & Beverage".

Olin Chemicals--See under "Acetic Acid".

Sesu Trading Corp.--See under "Acids".

SODIUM BENZOATE

Alok Chem Corporation--See under "Cream of Tartar".

Balaji Dye Chem.--See under "Additives, Food & Beverage".

Ganesh Benzoplast Ltd.--See under "Additives, Food & Beverage".

Navyug Pharm-Chem Pvt. Ltd., A/10 Avkar Apt., Opp. Nilambaug Palace, Bhavnagar 364 002. Tel: (0278) 24299, 428022, 429467. Fax: 091-0278-24299/428022.

Olin Chemicals--See under "Acetic Acid".

SODIUM CHLORIDE

Parul Enterprises, Top. Fl., Dharia House, Opp. New Vinod Silk Mill, Ashok Chakravati Rd., Kandivli (E), Bombay 400 101. Tel: 691730, 6127988.

SODIUM CITRATE

Gipsicko Laboratories (P) Ltd. -- See under "Citric Acid".

Kushalchand Sons -- See under "Gum Arabic".

Olin Chemicals--See under "Acetic Acid".

Vidarbha Fruit Products Co. Pvt. Ltd.-- See under "Calcium Citrate".

SOFT DRINK CONCENTRATES

Feroze Foods & Flavours--See under "Essences & Flavours".

Howrah Chemical Works, 148 Mahatma Gandhi Rd., Calcutta 700 001. Tel: 383919. Tlx: 021 2603 HCW IN. Gr: MONTHS.

SOFT DRINK MACHINERY

Goma Engineering Pvt. Ltd., See under "Beverage Processing Machinery".

SOFTY/THICK SHAKE MACHINES

Dairy Den (India) Pvt. Ltd. -- See under "Homogenizers".

SORBIC ACID

Concorde Chemical Corporation -- See under "B H A".

Kushalchand Sons -- See under "Gum Arabic".

Sesu Trading Corp. -- See under "Acids".

SORBITOL

S.A. Chemicals, 4/33, Malad Co-op. Hsg. Soc. Ltd., Poddar Park, Malad (East) Bombay 400 097. Tel: 8414872, 8409023. Fax: 91-022-8405347.

Vertex Chemicals -- See under "Liquid Glucose".

SOYA FOOD PLANTS

Forsberg Agritech (India) Pvt. Ltd.--See under "Grains & Cereals Cleaning/Grinding Machinery".

Goldin (India) Equipment Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery".

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery".

Soya Goodrich Ltd., Shivamurthy Circle, Shimoga - 577 201. Tel: (08182) 43370. Fax: 23398.

SOYA LECITHIN

Balaji Dye Chem --See under "Additives, Food & Beverage".

Kushalchand Sons -- See under "Gum Arabic".

Olin Chemicals--See under "Acetic Acid".

Sesu Trading Corporation--See under "Acids".

Soyachem Industries, G-3 Ankit Apartment, 31 Vishnupuri, A.B. Road, Indore 452001.

SPECTROPHOTOMETERS

Lab Instruments --See under "Heating Mantles".

SPICE FLAVOURS

Oror Flavours & Chemicals Pvt. Ltd.--See under "Food Flavours".

SPICE OLEORESINS

Bacto Chem Lab, 14(S) Technocrat Indl. Estate, 11, Stage, Balanagar, Hyderabad-500 037. Tel: 261081. Gr: BACTOCHEM.

SPRAY DRIERS

SSP Private Ltd. -- See under "Evaporators".

STABILIZERS

Burzin & Leons Agenturen Pvt. Ltd.--See under "Additives, Food & Beverage".

Indian Gum Industries Ltd. -- See under "Guar Gum".

Kapadia Gumchem Industries, 3 Mint Rd., 2nd Fl., Rm. No. 30, GPO Box 1160, Opp. GPO, Fort

Bombay 400 001. Tel: 2615073, 2617217. Fax: 91-22-2619473. Gr: PHARMAGUM.

STANDIPOUCH MACHINERY

Chinoy Electronics, S. No. 9/1/12, Sant Tukaram Nagar, Kharadi, Pune 411 014. Tel: 682240 (0212). Fax: 0212-681413.

Venus Packaging Services--See under "Crown Cap PVC Lining Machines".

STARCH

Dewang Corporation -- See under "Aromatic Chemicals".

S.A. Chemicals -- See under "Sorbitol".

Sagosome, Salem 636302. Tel: 447673/448046. Tlx: 450-272 SAGO IN. Fax: 0427-445028.

Santosh Industrial Fats Ltd., 7B/37, 10th Fl., Navjivan Society, Lamington Rd., Bombay 400 008. Tel: 3083283. Fax: 3080276.

The Sukhjit Starch & Chemicals Ltd., Phagwara 144401. Tel: 60314, 60758. Fax: 01824-61669.

Vertex Chemicals -- See under "Liquid Glucose".

STARCH, MAIZE

The Anil Starch Products Ltd., Anil Road, P.O. Box 10009, Ahmedabad 380 025. Tel: 2123222. Fax: 2110731.

STEAM BOILERS

Energy Machine, C1-B-423, GIDC, IV Phase, Vithal Udyognagar 388 121, Taluka-Anand, Guj. Tel: (02692) 3136, 32309. Fax: 02692-31371.

Ross Thermal Systems Pvt. Ltd., 33 Burhani Indl. Estate, Kondhwa, Pune 411 048. Tel/Fax: 676 518/630129.

Servo Flow Fabricators Pvt. Ltd., K/3 Shop No. 10, Hilton Co-op. Hsg. Society, Ramnagar, S.V. Rd., Borivali (W), Bombay 400 092. Tel: 805 3401; Fax: (PP) (91-22) 862 6490.

STEAM JACKETED KETTLE

See under "Kettles, Steam Jacketed".

Elma Industries, A-15 Aaram Society, Vakola, Santacruz (E), Bombay 400 055. Tel: 612 9315.

STERILIZERS

M.F. Marketing Pvt. Ltd.--See under "Pasteurizers".

Machinfabrik -- See under "Coolers, Vacuum, Batch".

Process Machinery & Equip-

ment Pvt. Ltd., 8/A Shyamprasad Mukherjee Rd., Calcutta 700 025. Tel: 478561.

STERILIZING/FUMIGATING EQUIPMENT

Thor Systems -- See under "Air/Dust/Fume Control".

STICKERS

Safex Systems -- See under "Adhesives/Tapes, PTFE, Glass".

STIRRERS

Fabdecon Engineers--See under "Agitators".

Fibre & Fibre Products, D-8/10, Jalnidhi, Bangur Nagar, Goregaon (W), Bombay 400 090. Tel: 8725510/8739780. Fax: 872 7455.

TANK CLEANING MACHINES/NOZZLES

Siddharth Enterprises, Naren-dra Estate, Opp. Kamgar Stadium, S.B. Marg, Dadar, Bombay 400 028. Tel: 4223288, 4224888. Tlx: 011-71256. Fax: 91-22-4370388.

TANKS & VESSELS

Food Tech Engineers--See under "Machinery, Food & Beverage Processing".

TEMPERATURE INDICATORS/CONTROLLERS

Industrial Instruments Co., 91 Silver Jubilee Park, Rd., Bangalore 560 002. Tel: 2221403. Fax: 91-80-2270585 ATTN: 15.

TEMPERATURE MEASURING PRODUCTS

Industrial Instruments Co. -- See under "Temperature Indicators/Controllers".

TESTING LABORATORY, ADDITIVES

See also "Laboratory, Testing".

Bangalore Test House, 65, 20th Main, Marenahali, Viyanagar, Bangalore 560 040. Tel: 335 6415/338 5979. Gr: TEST HOUSE.

Sanford Analytical Laboratories, 3rd Stage, West of Chord, Bangalore 560 079. Tel: 359493. Gr: SANFORD.

THERMOFORMING MACHINES

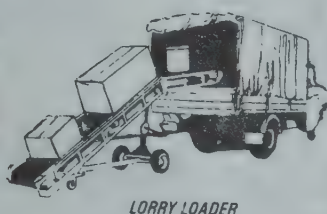
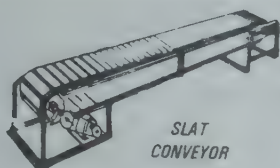
Samarpan Fabricators Ltd.-- See under "Filling & Sealing Machines".



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Tinmaco Engg. Co., Plot No. A/67, Rd. No. 21, Wagle Indl. Estate, Thane 4. Tel: Fact: 5320802/1465. Resi: 5603578. Fax: 5320193. Tlx: 011-72389 TEWE IN.

TIN CONTAINERS

Aifso Enterprises -- See under "Oven, Bread/Biscuit Baking"

Kaira Can Company Ltd., Tiecicon House, Dr. E. Moses Rd., Bombay 400 011. Tel: 4964375 (5 lines). Fax: 495 0482.

Swastik Industries -- See under "Containers, PET/Plastic/Metal"

TRAVELLING OVENS

Admir Engineers -- See under "Bakery/Biscuit Equipment"

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C.M. Equipment & Instruments (I) Pvt. Ltd., B-194, 5th Main Rd., Peenya II State, Bangalore 560 058. Tel: 8393711. Tlx: 0845, 2066 (CMEI); Fax: 8395 343.

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Sakav Enterprises--See under "Air Dryers"

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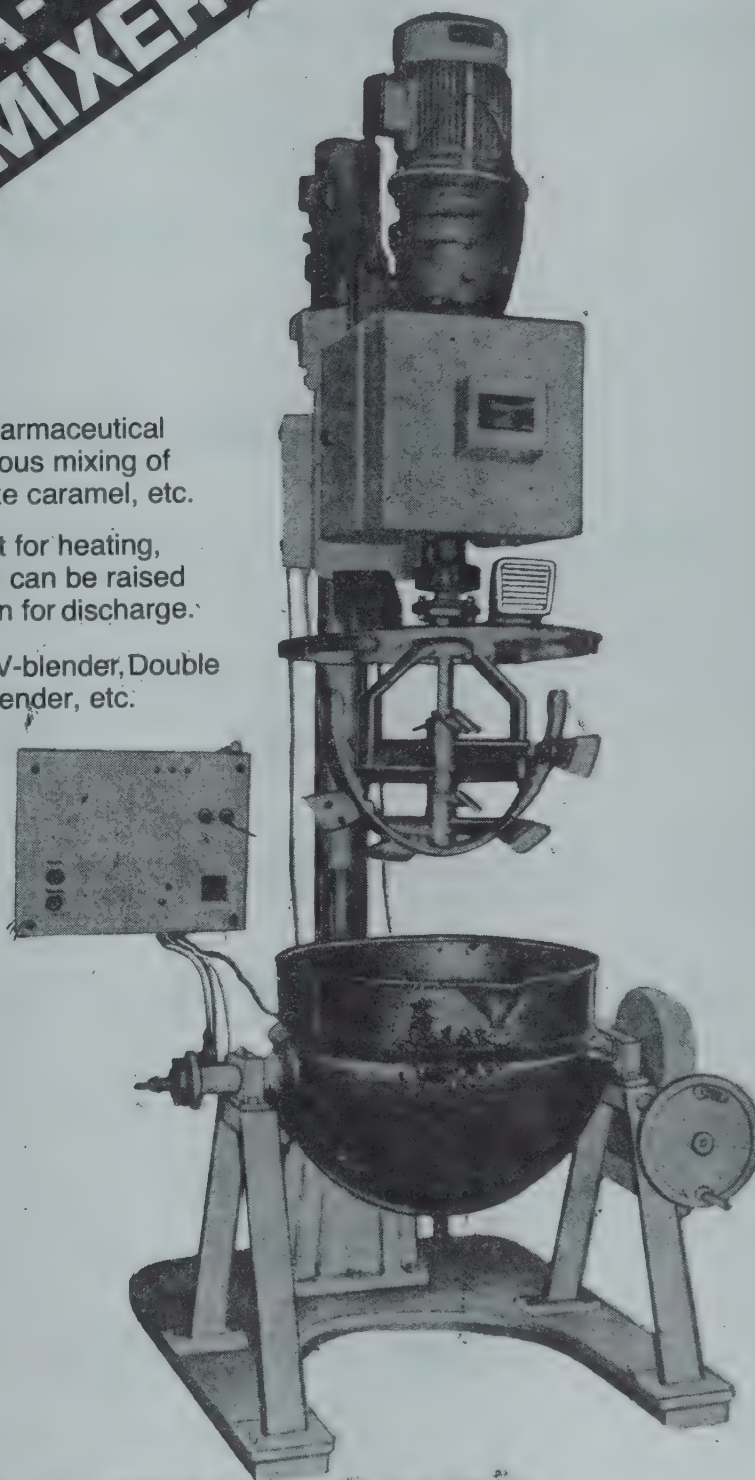
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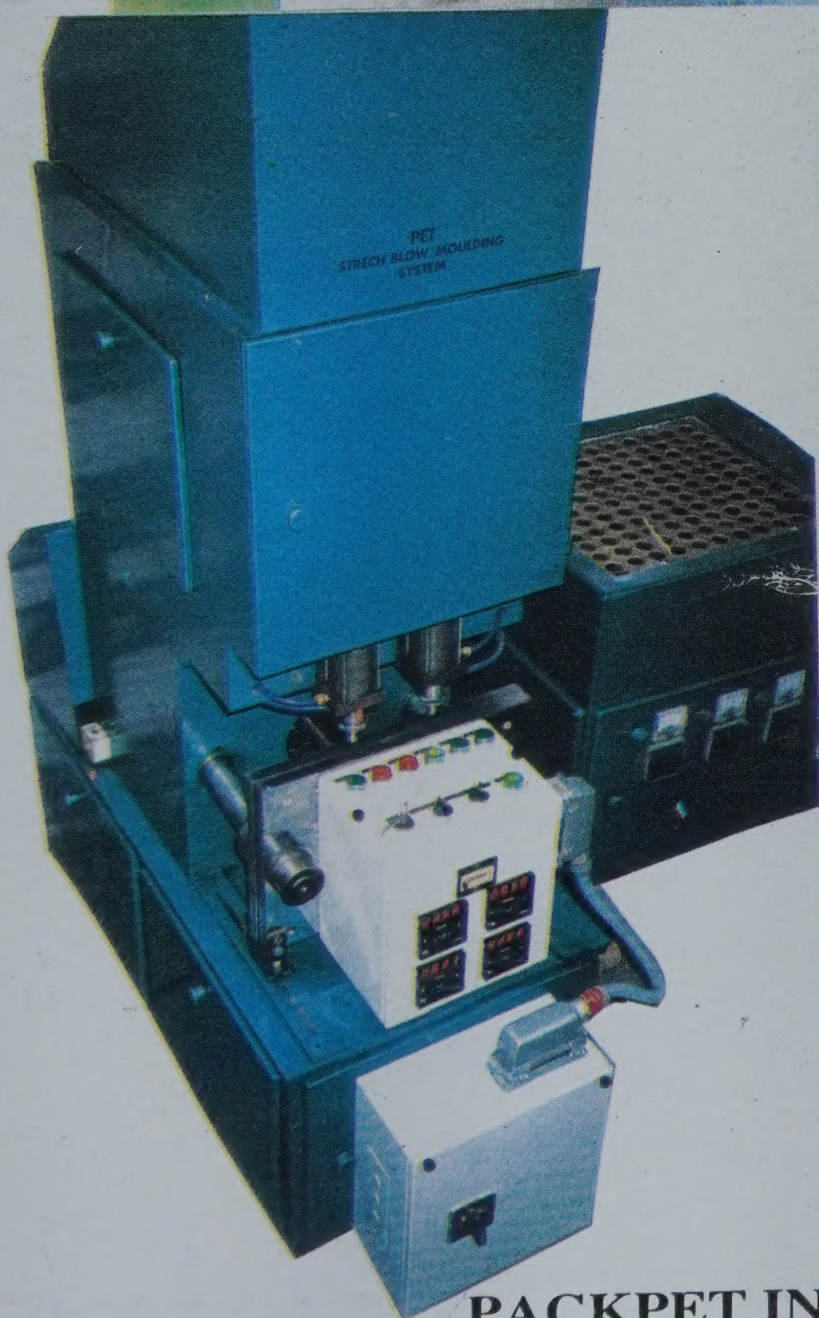
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